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Tanzania Rural Roads Feasibility Study

Final Report
Volume I
Technical & Economic Aspects

Prepared for
U.S. Agency
for International Development

LYON associates, inc.
in association with
James R. Snitzler Associates, Inc.

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Office of Development Resources
Bureau for Africa
Agency for International Development
Washington, D.C. 20523

Reference: Project AID/afr-C-1605

Dear Sirs:

It is our pleasure to transmit the Final Report of our Tanzania Rural Roads Feasibility Study in fulfillment of the Contract AID/afr-C-1605. The report has been assembled in three volumes:

Volume I Technical and Economic Aspects
Provides the summary and recommendations, background, social analysis, project selection and prioritization, technical analysis, and feasibility analysis.

Volume II Training Requirements
Provides the training requirements in terms of manpower, methods of training, and outlines of training programs.

Volume III Environmental Assessment
Provides descriptions of the environment of the project areas, probable environmental impact of project implementation including probable adverse impacts, and the relationship of the proposed action to land use plans, policies and controls.

Thirteen (13) sets of these volumes are submitted in accordance with the contract for distribution as follows:

5 copies for the USAID Mission in Tanzania
3 copies to REDSO/EA in Nairobi
5 copies to the Office of Development Resources, Bureau for Africa, AID/Washington.

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Please note that there is no Table VII-4. This heading was inadvertently skipped during tabulation. Also Table VII-9, which is included with Table VII-8 on page VII-51, has been further separated so that it can be more clearly identified.

We are most appreciative of the fine cooperation of all participants in the Study, including the AID offices in Washington, Dar-es-Salaam and Nairobi as well as the Tanzania Government offices in Dodoma, Singida Kilimanjaro and Dar-es-Salaam. All regional and district development staff members were most hospitable and helpful.

Very truly yours,

LYON ASSOCIATES, INC.

Fredrick Everhardt
Secretary

FE:WJM:cz

TANZANIA RURAL ROADS

FEASIBILITY STUDY

FINAL REPORT

VOLUME I

TECHNICAL AND ECONOMIC ASPECTS

PREPARED FOR:

U.S. AGENCY
FOR INTERNATIONAL DEVELOPMENT

LYON ASSOCIATES, INC.

IN ASSOCIATION WITH

JAMES R. SNITZLER ASSOCIATES, INC.

ACKNOWLEDGEMENTS

Considerable effort was expended by the consultant in securing pertinent field data during trips to Dodoma, Singida and Kilimanjaro Regions as well as collected data available from various Government agencies and organizations in Dar es Salaam. Without the extraordinary cooperation and assistance of the Tanzanian officials and staff members, the task of gathering the data and preparing this report would have been extremely difficult, if not impossible. At each Regional and District headquarters, the Team was received with hospitality and friendliness. Although it is not possible to list each individual by name, the consultants wish to express their sincere appreciation to all who assisted, particularly representatives of the Prime Minister's Office, the Regional Development Directors and their staffs, the District Development Directors and their staffs, the Ministry of Works, the UNDP Mission, and the USAID Mission in Tanzania.

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I. SUMMARY AND RECOMMENDATIONS

A. Summary of Major Elements

1. Brief Project Description

The emphasis in recent years in Tanzania has been largely concentrated on rural development. A major impediment in the rural developemnt progress has been the extremely poor condition of the existing rural roads, including not only access or feeder roads but secondary and tertiary roads as well.

The primary objective of this feasibility study is to provide assistance in the construction or rehabilitation of a designated quantity of roads in Dodoma Region, Singida Region and the districts of Same and Mwanga in Kilimanjaro Region. The purpose of the rehabilitation or construction is to insure that the rural areas in these districts have greater access to social services, rural development programs, and agricultural production. Further economic benefits that will accrue are reduced travel time and costs for people and goods and to provide transportation services where none now exists due to unsatisfactory or impassable roads.

An equally important objective is to provide a capability within these districts to rehabilitate and maintain these rural roads by improving the administrative, planning, construction and maintenance capacity of the regional and district road organizations. This capability is to be acquired through training of manpower, purchases and repair of equipment, and the formation of an organization that can function effectively on a permanent basis rather than for a rapid temporary rehabilitation program. It is felt that providing the on-going maintenance and rehabilitation capability is as important as the rehabilitation itself.

2. Impact Analysis

a. Economic

The major economic and quantifiable impact identified with the rural access road rehabilitation and maintenance program was that of incremental agricultural crop output associated with increases in productivity on lands now under cultivation. The impact, in the form of a positive benefit, was determined by analyzing production costs and returns for each of eleven major crops based upon traditional versus improved agricultural practices of smallholders.

The traditional practices are those which are prevalent throughout the study regions with much of the cause attributable to the poor condition of the rural access road network. As a result of no access, restricted access, or high-cost access when served by trucks, it has been extremely difficult to provide assistance to the traditional smallholder in the form of extension service, crop financing, and other aspects which would allow him to rise from a subsistence position of livelihood to that of a reasonably permanent member of the exchange economy.

The change from traditional to improved is both the result of ongoing and actively planned agricultural technology improvement programs and the rural access roads rehabilitation and maintenance programs. No data exist which would make it possible to accurately measure the complementary contribution which each is making, or the degree of success which each would achieve without the other. But one can logically assume that the complementary contribution of the two working in tandem would be much greater than if one or other of the two programs did not exist.

The consultant, in discussions with transportation experts, economists, and other knowledgeable persons, determined that the improved rural access road program would add about 60 percent of the benefit to the total effort to bring about the adoption of improved agricultural practices by the smallholders. Total benefits, associated with the change from traditional to improved, were thus reduced by 40 percent to allow for the residual (60 percent) to be identified with the improved rural access road program.

Previous adjustments had also been made in the total benefits of the traditional versus improved, by deducting that proportion of the benefits identified with smallholders in the three study regions not included within the rural access program recommended in this study.

The net agricultural benefits, after deductions for net annual maintenance costs of T/shs 44,725,000, (US $5,590,600) discounted to present values at rates of 25 and 15 percent respectively, indicate by interpolation, an internal rate of return of 17.3 percent. This rate signals a strong economic justification for the rural access road program based upon the accepted standard of 10 per cent as representative of the opportunity cost of capital for the Tanzanian

economy.

Application of this internal rate of return analysis to each of three study regions would have about the same results as for the overall road project, since the benefits derived are determined on an individual hectare basis, with the range of the various crops of about the same order of magnitude in terms of benefits.

It should also be noted that despite the strong showing, the internal rate of return is undoubtedly understated, due to data gaps on essential information. For example, user savings from passenger traffic would add significantly to the IRR, since savings by bus transportation based upon current costs of the existing versus improved rural access roads were estimated to range from 17 to 53 percent per vehicle-kilometer in Dodoma Region. Unfortunately, the absence of historical or current traffic data of any kind prevented the computation of these anticipated savings.

There is also additional crop production in the study regions, other than the eleven crops for which costs and margins data are available, which might add perhaps an additional 10 percent to the internal rate of return.

A further economic benefit associated with the rural access road improvement program is that of employment of the local labor force. These employment opportunity benefits will arise in particular with the maintenance portion of the rural access program. An estimated 4,560 local laborers will be required annually throughout the combined project areas when the maintenance program is fully operational. It is scheduled to reach that status by the end of year three of the rehabilitation program. Between year one and year three, of this program, local maintenance laborers will be hired and begin working as the numerous roads are rehabilitated. The regional requirements for local maintenance labor on an annual basis will be as follows:

Dodoma	- 2,530
Singida	- 1,400
Same/Mwanga	- 630

Wages to be paid the local laborers are calculated at T/shs. 300 per month, or T/shs 3,600 per year. The total annual wage bill would thus be T/shs 16,416,000, with the regional breakdown

as shown below:

Dodoma	T/shs 9,108,000
Singida	T/shs 5,040,000
Same/Mwanga	T/shs 2,268,000

These additional employment benefits will provide a very substantial boost to the families of the laborers and to the local villages in which they live. This is especially so when one considers that the return per labor day for the traditional smallholder ranges from T/shs 4.5 to T/shs 8.0.

It is anticipated that improvement of rural access roads will impact positively upon the efficiency of current and future small industry operation, and forest and fish production and marketing. Most of the benefits will be observed in the efficient transport of finished products, or, as in the case of natural resource development, the transport of forest products and fish.

Small industry development should be enhanced by opening rural areas to investments in small factory sites, and to the distribution of finished products. As the roads are improved, the costs of transporting inputs for production and finished products to markets will be reduced. Improved roads will also facilitate the transport of development personnel, employers, potential buyers, and factory maintenance supplies and spare parts, as well as equipment replacement.

Natural resource development, specifically forest products and fish production will be impacted as well by improved roads in areas other than harvest product shipments. Forestry products and fish production and development are dependent on production monitoring, resource management, reforestation, and fish stocking. The present condition of the rural roads precludes the level of services necessary to fully develop the potentials of existing resources and implement future national goals for forest and fish product development.

b. Impact Analysis - Social

The following paragraphs summarize the expected social consequences of improved rural access roads in the regions of Dodoma, Singida, and the Same/Mwanga Districts of Kilimanjaro. These summary statements and conclusions are supported by more extensive data reported in the text and in Appendix. A-IV.

(1) Social Composition of Rural Villages

(a) Background

Extensive villagization occurred during the 1970s in Dodoma and Singida regions so that few areas are not now organized as relatively compact, ujamaa villages. This change has resulted in a major shift for most of the peoples of these regions from the typically dispersed household and/or compound settlements. In the Pare Mountains (Same/Mwange Districts of Kilimanjaro Region) by contrast, the 1970s brought extensive changes as many previously private enterprises were replaced or supplemented by cooperative ventures. In this area, where the population tends to be concentrated in the highlands and in some parts of the adjacent plains, there has been relatively little transformation of traditional settlement patterns. The pattern here is one of ujamaa cooperatives developing in existing villages rather than the development of ujamaa villages per se.

(b) Expected Impact of Improved Roads

To the degree that the proposed program of road improvements does not alter transportation channels among rural communities, the improvement of existing roads (as opposed to the building of new roads where none presently exist) is not likely to alter the distribution of rural communities. Most ujamaa villages in Dodoma and Singida Regions are currently well established. Improved linkages among communities is not expected to alter the distribution of villages per se, or to cause any major shifts in population such as is typical in many situations when people find it economically attractive to move closer to an improved road. This stands in contrast to the situtaion which might be expected, if new roads were being contemplated, or if ujamaa villages were not so firmly established as an organizational pattern in Tanzania.

Similarly, in the Same/Mwange Districts of Kilimanjaro Region where villages are uncommon, the topography is such that road improvements again are not likely to alter the

residential patterns of rural communities. This is so because people tend to live now in those areas most suitable for agricultural, herding, and other productive activities. Moreover, most land in the productive and useful areas of these districts is currently settled, and there is simply not much flexibility with regard to a redistribution of population.

(2) Ethnic Composition of Rural Villages

(a) Background

Tanzania is a country with considerable ethnic complexity. Many of its 130 tribal groups (as enumerated in the 1967 census), however, share considerable linguistic and cultural similarities. The districts in the study area can be characterized from an ethnic perspective in the following ways: some districts are relatively homogeneous ethnically, with a single group accounting for nearly the entire population; some are diverse with no single ethnic group accounting for as much as one-half of the population; and others are ethnically complex but have a dominant ethnic group. In a similar fashion, rural villages located within these divisions range from great ethnic homogeneity to considerable heterogeneity in culture and/or traditional languages.

(b) Expected Impact of Improved Roads

There are several reasons to expect an increase of ethnic complexity in the rural villages of Tanzania along with improvements in rural access roads. These reasons include: increased population mobility in the country in general, a national policy which emphasizes Tanzanian citizenship over traditional ethnic loyalties, and the stationing of teachers, agricultural extension officers, health personnel, and other government employees in areas other than their traditional "tribal" homelands. The questions which are difficult to answer, on the basis of available evidence, are the actual <u>degree</u> to which communities will become more complex ethnically over the next several years and the degree to which improved <u>roads</u> per se are a direct (as opposed to an indirect) cause of

greater heterogenity. It is expected that roads will contribute, at least indirectly, to more ethnic mixing of rural Tanzanian populations, but the project, as outlined, is not expected to result in a radical alteration of the current ethnic composition of the concerned regions.

(3) Mode of Livelihood

(a) Background

With few exceptions, the majority of the population in the areas of concern are currently subsistence farmers who often supplement family income with the sale of surplus food crops, cash crops, and/or wage labor (the latter to a much lesser extent). The specific crops which are grown for food and sale differ. In some instances, people rely heavily on millet whereas in others the staple is maize. Milk (and to a lesser degree, animal protein) varies from a highly significant part of the diet to only a small proportion or to virtual absence. Small craft industries, shopkeeping, and other similar activities do not account for a major portion of family income for the majority of the population in Dodoma or Singida Regions. Wage labor, outside their home communities, is a significant factor in the livelihood of the residents of Same/Mwanga Districts in Kilimanjaro Region. In all areas, there is some cash cropping and sale of surplus food crops, but the proportion of livelihood derived from cash earnings through crop and/or livestock sales varies considerably from village to village, from family to family, and - due to Tanzania's unpredictable rainfall patterns - from year to year.

(b) Expected Impact of Improved Roads

Road improvements can be expected to have impacts on all modes of livelihood in rural Tanzanian villages. For the subsistence farming sector of the economy, improved rural roads will ease the access of extension officers who work with both agriculture and livestock. For cash crops, food crops, and surplus, this access will facilitate the movement of crops to market. However, it should be

noted that the specific movement of crops to market is only one of several aspects concerning the relation between sale of crops and rural roads. Others include the possibility that improved roads will make it easier for agricultural/livestock extension services to reach villagers and for the limited amounts of chemical fertilizers and other inputs which are used in these areas to be transported into the villages. Transport of goods to market is usually possible despite the poor quality of many of the roads. While much of the crop tonnage is transported to markets during the dry season when roads are easiest to pass, it is not possible to complete the transportation during the dry season. The consequence of this is more difficult transportation during the rainy season, the possibility of spoilage due to rain damage for certain crops, and the likelihood that some crops never make it to market due to the poor quality of the roads and the extraordinary effort involved in transporting them. Perhaps, the most specific consequence of improved roads and the sale of surplus food and cash crops, is the greater ease of access to market - which improved roads would provide. This in turn, would result in greater efficiency of transportation, reduce the cost of transporting goods to market (a benefit which might be expected to be passed on at least indirectly to producers), and a reduction in the ratio of vehicles to tonnage transported as well as direct damage to vehicles resulting from poor quality roads. For those engaged in wage labor outside home communities, improved transportation facilities would ease the access to places of work, as well as the ability to return home, as necessary.

(4) Mobility

(a) Background

The proposed project would improve existing roads rather than build new ones. Given this focus, the project would have, at least, two important consequences for the rural communities in the areas which will be involved.

These are: (1) improved access for those communities which now have only poor quality links to the transportation network, and (2) the possibility of all-weather access for those areas which now are accessable during only certain parts of the year. Further, some of the more remote areas which will not be directly affected by improved roads in their own villages or communities will be brought closer to improved transportation facilities.

(b) Expected Impact of Improved Roads

Almost uniformly, the perception of rural villagers in the areas of concern, is that road improvements will have its most direct impact in improving and providing more regular access rather than providing access where none currently exists. Specifically, this means: roads are more likely to be passable on a year round basis; a greater variety of vehicles can use the roads; vehicle owners will be less reluctant to travel to certain villages as the potential for damage and wear on the vehicles is reduced; the efficiency of transport will be increased (i.e., vehicle life will be longer, operating costs lower, and existing vehicles can provide more service).

In commenting on the probable impact of improved roads, villagers emphasized the fact that roads are only a part of the total equation of improving transportation and communication facilities in rural Tanzanian communities. Road improvements must be coupled with the availability of vehicles to transport both people and goods. Otherwise, the roads serve only limited purposes and are likely to be of little or no sustained interest to villagers. Although, it is outside the scope of the present project to deal with the specific issue of increasing vehicles per se, it must be kept in mind that this matter is fundamentally linked in the minds of the villagers whose communities will be served by the rural roads slated for improvements.

Some differences can be expected with regard to the social impact of roads on mobility for Singida and Dodoma Regions as opposed to the Same/Mwanga Districts of Kilimanjaro.

These differences stem from the respective social situations as well as the topography of the two areas. For Dodoma and Singida, improved roads mean an improvement in the accessibility of social services (whether the services are brought to the communities or the people travel, as in the case of major medical facilities, to the facilities themselves). It also means that surplus food and cash crops can be transported to market more efficiently and readily - with the consequence of a higher and faster return on labor and effort to the producers. Specifically, Singida and Dodoma residents mentioned the transport of people to hospitals as the most significant benefit of improved roads. Next in importance, was the provision of social services on a wider and more regular and dependable basis, whether these be supplies for the schools, visits of the agricultural or livestock extension agents, or whatever. The transport of goods to market, as perceived by villagers, is of somewhat lesser importance as a consequence of improved roads. They point out that the marketing companies seem to manage to come to collect the goods produced for sale - although this is not always as fast or as timely as might be desired. When shortcuts must be made, it is usually, as they point out, in the provision of social services. For people living in Same and Mwanga Districts of Kilimanjaro, these same issues apply with respect to roads and their consequences. However, it should be noted that the highland areas of Mwanga District do have roads which can be passed in all weather conditions (although often slowly and with great difficulty) whereas the people living in the highlands of Same District lack all-weather roads and regular vehicles providing transportation services for goods and people. Thus, for Mwanga Division, improved roads would mean an improvement in efficiency of social services, while it would mean the provision, for Same District, of social services which are either unavailable, available only sporadically, or available at great expense.

For both Same and Mwanga, but especially for Mwanga District, where there is considerable population movement in and out of the highlands due to wage labor employed outside the area, the improvement of roads would make this aspect of life easier for the population.

Finally, it should be noted that many of the above comments discuss the social benefits of improved roads as perceived by persons who live in the areas which will be concerned. While their perceptions are improtant, it should be recognized that there are additional benefits as well as possible problems, which become apparent when a more detached and larger systemic view is attempted. In considering the social consequences of the project, it is important to attempt to combine both the viewpoints of the concerned people with the outsider's perspective in evaluating the total impact of the proposed program.

(5) Specific Issues Concerning Impact on Women

(a) Background

Little is known about the traditional role of women in most Tanzanian societies since the ethnographic literature tends to ignore such matters. In those cases where some information is reported about the role of women in traditional societies, it is often relegated to a section on domestic life as though women's opinions and actions are unimportant or inconsequential in public life, in economics, and many other aspects of the cultural systems. Thus, very little is known about women in the traditional cultures of the areas of concern. Further, the Tanzanian government and party structure is such that when conducting field interviews in twelve villages with a variety of government officials, party officers, teachers, village elders, and others, the social anthropologist was never introduced to a woman in any of these capacities. Those few with whom he was able to talk had to be sought out especially and in no sense was an adequate view of women and their roles, perceptions, wants, etc., gained in any

of the communities. Thus, what follows is predicated on the strong statements that very little information exists about women in the secondary sources and that very little was possible to gather in the field given the time limitations and the manner in which the bureaucracy introduced the anthropologist to villagers (i.e., from RDD through DDD to village and party chairmen who were always men).

(b) Expected Impact of Improved Roads on Women

The hiring of laborers in road construction and maintenance is almost certain to mean the hiring of men, not women. (The question of whether women are physically able to do the required work seems inappropriate and irrelevant given the tremendous amount of agricultural work which women do.) The employment of men in road projects is likely to place a greater burden on women who will have to assume, as a consequence, an even greater burden of the agricultural and domestic activities.

In addition, it is tempting to speculate that improved roads will mean better health care for women and children, thereby improving the lives of many women in rural Tanzania. However, it should be kept in mind that improving child health (and presumable reducing infant mortality) unless coupled with other programs to reduce the birth rate will in the end result in a greater burden on women.

Also, the income which the road is likely to generate (in jobs, increased sales of cash or surplus food crops) is more likely to go directly to men. Given African social structure and the typical patterns of men and women retaining control over their own income rather than treating it as a "family budget", these benefits are not likely to be as widely distributed among women as among men.

A final consideration to bear in mind in evaluating the social consequences of development programs for Tanzania is the relatively egalitarian nature of the social structure. The problems which are likely to occur for women as a result of improved roads are probably less severe than

might be the case in many, or even most other Third World countries. Nonetheless, there is little evidence to believe that all the consequences for women will be positive, although many will be.

(6) Education

(a) Background

For Tanzania in 1980, primary education is available to virtually every child throughout the country. This is also the case with regard to adult education courses which are typically offered in the local schools. Secondary schools are unevenly distributed in the country, and even where they exist in relatively high frequency (as for example in Same/Mwanga Districts), students travel considerable distances and almost, without exception, board while attending secondary school. Villagization in Singida and Dodoma has resulted in the close proximity of the population to primary schools. This is in marked contrast to the previous population patterns where children often lived far from school. The same point applies to adults with regard to adult education classes, since these courses tend to be offered in the local schools on a wide variety of topics ranging from improved farming/herding techniques, literacy, health, civics, and others.

(b) Expected Impact on Education of Improved Roads

Improved rural roads can be expected to provide a greater and more regular access of supervisors to schools located throughout rural districts, and consequently, a better monitoring and provision of assistance to local teachers. In addition, improved roads will make it easier to provide supplies (such as books) on a more regular and sustained basis as well as construction and maintenance supplies needed for school buildings and teachers' housing. Also, easier access to outside experts to teach adult education classes should be a direct consequence of road improvements (although, it should be noted that current policy is to attempt whenever possible, to use the talents

of resident experts - teachers, medical personnel, etc. - instead of bringing in outside experts to teach such courses).

(7) Social Services

(a) Background

Since independence, Tanzania has been engaged in the process of increasing the social services available to rural villagers who constitute over ninety percent of the country's population. This process has proceeded at different rates in different parts of the country. Current policy is aimed at providing basic essential services on an equitable basis for all parts of the country. Due to transportation problems, remoteness, and the current developmental status of different villages, making these services available throughout the country requires different degrees of effort. However, in virtually every aspect of providing these services, the quality of the road or roads which link the community to the rest of the country is a critical factor.

(b) Expected Impact of Improved Roads

With regard to water, improved roads are likely to have the following kinds of effects: facilitating the access of building and maintenance personnel to the communities where bore holes, windmills, and other improved water sources are located; making it easier to provide assistance to local communities when experts are needed to either repair or provide assistance in repairing equipment as well as facilitating the transport of replacement parts for improved water supplies; and the provision of more adequate and plentiful sources of water for both human and livestock, which can be expected in turn, to increase the overall health of both humans and animal by reducing the incidence of waterborne diseases and lessen the work load for herders who must, in the dry season, often take their animals considerable distances from their home villages to get enough water and pasture.

With regard to health facilities, improved roads can be expected to have a number of social benefits. These include: improved access of people to medical facilities; improved access of medical personnel to dispensaries so that regular services can be maintained and local medical assistants can be helped and monitored in their work; and facilitate the transportation of supplies (e.g., medicines) to hospitals and dispensaries.

In transportation, as noted in the discussion on mobility above, an improved rural road system can be expected to increase the likelihood that more services will be available on a regular and sustained basis. An overall improvement in efficiency of the delivery of all sorts of social services can be expected, including that of mail.

(8) Manpower for Construction and Maintenance of Rural Access Roads

The proposed program for construction and maintenance of rural access roads will provide jobs and hence income for many people in the three areas. The direct consequence of this is an important input into the economy of the local community. It should be noted, however, as discussed under the section on women above, that it is most likely that those who will be employed in construction and/or maintenance will be men. Thus, the project as outlined may shift greater agricultural and domestic burdens on women without providing any real inputs into household economics, since the patterns of payment are not to households but to the individuals who work on the project.

In order to reduce the possible adverse impact on women, implementation of the proposed program should seriously consider employing women for some or all of the tasks.

It should also be kept in mind that, in addition to employing persons in construction and maintenance positions in the proposed program, there is an available supply of labor which can be deployed for road maintenance and

perhaps some aspects of construction. This source is the pool of community labor which all Tanzanians are expected to contribute (without direct compensation) to the nation's building tasks.

(9) Possible Adverse Effects of Road Improvements

Although the overwhelming balance of social consequences of the proposed program are deemed to be beneficial, a few negative ones (e.g., the possible negative consequences for women) have been mentioned. In addition to these, there are some other possibilities which should be mentioned. These include such factors as the increase of disease which is sometimes associated with increased population movements, increased alcoholism which sometimes results when community norms are disturbed and cash for purchase of alcoholic beverages becomes more available, etc. However, few such problems are apparent and, insofar as projections based on available data are possible, the problems which have been noted elsewhere are not expected either to be serious or to warrant changes in the project as outlined.

3. Prioritization Criteria[1/]

Prioritization criteria based upon economic, and social and cost factors were established for 54 administrative divisions encompassing the 4,336 kilometers (145 individual road segments) in the three regions of the road study, Dodoma, Singida, and the Same and Mwanga Districts of Kilimanjaro. By establishing priorities for each of the 54 administrative divisions, in effect priorities were established for the road clusters within each division as compared with all other divisions of the region. Priorities of roads within each division were determined by giving consideration to the individual road priorities compiled by the District Engineers for each of their respective districts, and to the factor of location in terms of an orderly and efficient process in accomplishing the road rehabilitation program.

1/ Further details of the prioritization criteria, including data tables, may be seen in Part VI, PROJECT SELECTION AND PRIORITIZATION.

The administrative division was selected as the pivotal unit for the gathering, compilation, and evaluation of the economic and social data, since it is the smallest political unit for which data could be compiled.

The divisional priorities, which were established on a regional basis, made possible the determination of priorities among the districts of each of the regions.

Preliminary screening criteria were developed as a first step in the road selection and prioritization scheme in order that ineligible candidates be eliminated early in the process. It defined "the universe" of the study as including all rural access roads in the three areas, except for trunk roads, with the further requirement that all roads to be considered as likely candidates for the rehabilitation program must be at least 6 kilometers in length, and/or at least 6 kilometers distant from the nearest roughly parallel road.[2/] Finally, the road candidate must connect to an all-weather road or a likely candidate for rehabilitation, while the connecting road must lead to a marketing and/or administrative center.

A small number of roads were eliminated as a result of the application of these criteria.

The minimum length and distance requirements cited above, averaging only 3 kilometers from the midpoint, are not excessive for the rural people of Tanzania who are used to walking and carrying burdens considerably longer distances. These cutoff points were also necessitated by the weak financial condition of the national economy and the great need for improving the entire basic rural access road structure, insofar as possible, given the previous constraints.

A survey was made of the availability of key economic and social data which could be used as indicators, and efforts were directed in the field and in Dar es Salaam to the gathering and compilation of such data in as complete a fashion as possible. These indicators included six economic and five social, consisting of: for the economics - agricultural crop sales, livestock sales, forest products production, fish production, small industry sales, and agricultural potential, while the social factors included - population, population density, education, health, and rural water supply.

2/ Minor exceptions were accepted to avoid bottlenecks between rehabilitated road sections.

For the above economic and social factors, measurement units were determined based upon data availability, i.e., metric tons for agricultural crops number of head for livestock, etc., and measuring parameters (range of factor values such as 0 to 11,000 metric tons for crops) were assigned along with the common rating scale (0 to 100 for crops).

Initial relative weights for each of the economic and social factors were determined by the consultant and reflect the knowledge gained in the intensive field surveys and from other sources, as well as the prior experience of the consultant in similar studies. Based upon an analysis of each factor, the following weights were assigned:

	Economic Activity	Percent
1.	Annual Average Crop Sales	17
2.	Annual Average Livestock Sales	3
3.	Annual Production Forest Products	2
4.	Annual Production Fish	1
5.	Annual Small Industry Sales	2
6.	Agricultural Potential	25
	Total	50

	Social Aspects	Percent
7.	Population	10
8.	Population Density	4
9.	Education (Student to Teacher Ratio)	6
10.	Health (Health Facilities to Population Ratio)	7
11.	Rural Water Supply (Adequacy of Supply)	3
	Cost Aspects	
12.	Road Construction	20
		50

The above weights for each factor were applied to the ratings by administrative division and the results totaled. Priorities of administrative divisions within each of the regions is thus determined by ranking the divisions from top to bottom based upon the numeric score of each. These

rankings show a good distribution of top ranked divisions among the districts of the three regions. For Dodoma Region, the first five divisions are located in three of the four districts, while in Singida Region, the top ranked five divisions are located in two of the three districts. Similarly for Same and Mwange Districts - the top five divisions are split with three in Same District and two in Mwanga District.

A comparison of the above priorities for the administrative divisions, with the district engineer's individual road priorities within each division or between two or more divisions shows a surprisingly close coordination for most of the divisions and the districts. (See Part VI., Table VI-7.)

A cohesion has thus been largely achieved between priorities based upon socioeconomic and cost factors and those reflecting needs as perceived by the District Engineers.

4. Technical Analysis

a. Existing Road Facilities

The present condition of the existing road network is poor to very poor. Most road sections have deteriorated to the point where routine maintenance activities cannot be performed and complete rehabilitation is required. Very little rehabilitation work is underway due to shortages of equipment, funds, trained manpower and adequate supervisory personnel. Maintenance is nonexistent to generally unsatisfactory and deterioration is continuing.

The total network of roads, (exclusive of Trunk Roads, which were not included in this study,) are as follows:

SUMMARY OF ALL ROADS AS PROVIDED
BY REGIONAL/DISTRICT ENGINEERS

PRESENT CLASSIFICATION

Region	District	Local Main	District	Feeder	Total
Dodoma	Mpwapwa	112	301	1,025	1,438
	Dodoma	0	499	792	1,291
	Kondoa	155	247	698	1,100
	Subtotals	(267)	(1,047)	(2,515)	(3,829)
Singida	Singida	0	208	721	929
	Iramba	24	250	454	728
	Manyoni	0	82	514	596
	Subtotals	(24)	(540)	(1,689)	(2,253)
Kilimanjaro	Same	163	198	117	478
	Mwanga	93	340	102	535
	Subtotals	(256)	(538)	(219)	(1,013)
	TOTALS	547	2,125	4,423	7,095

These figures were provided by the various districts and include a few segments that are planned but not built, not even as tracks. A summary of the roads inventoried by the Study Team during 3 field visits is as follows:

SUMMARY OF ROADS INVENTORIED

PRESENT CLASSIFICATION

Region	District	Local Main	District	Feeder	Totals
Dodoma	Mpwapwa	98	89	0	181
	Dodoma	0	322	144	466
	Kondoa	166	167	24	168
	Subtotals	(264)	(578)	(168)	(1,010)
Singida	Singida	0	174	233	397
	Iramba	21	219	34	274
	Manyoni	0	89	105	194
	Subtotals	(21)	(482)	(362)	(865)
Kilimanjaro	Same	99	143	0	242
	Mwanga	63	4	61	128
	Subtotals	(162)	(147)	(61)	(370)
	TOTALS	447	1,207	591	2,245

b. Organization

The Regional and District shops are, almost without exception, poorly organized and lack the basic maintenance and repair facilities and spare parts to function effectively. There is a serious shortage of engineers and qualified personnel down to and including the foreman level. Many engineers, technicians and skilled personnel have little significant experience due to the poor record of maintenance, construction and rehabilitation activities.

One of the major obstacles to an effective highway organization is the lack of qualified and experienced staff. This is believed to be due in large part to management. There is no shortage of skilled labor, although the level of skill for many of those listed might be questioned. The properly trained and skilled workers are overwhelmed in workshops by poor organization, lack of parts and equipment and few incentives to produce.

Sub-professional and professional staff is a more serious shortcoming in that the available supply is small indeed. Sub-professionals, or technicians, are promoted to higher positions because no qualified engineers are available. This situation is expected to continue for several more years.

B. Recommendations and Conclusions

1. Proposed Rehabilitation

The proposed rehabilitation program will involve basically three operations:

a. Clearing and shaping, in which the roadway is cleared of vegetation and the ditches cut and shaped with the excavated material being used to form a properly crowned road section. Unsatisfactory material is removed and replaced but extensive embankment construction is performed by...

b. Embankment and surfacing, which follows the clearing and shaping and rehabilitates the roadway by importing borrow for embankment and granular surfacing material, as well as repairs to erosion damage and constructs erosion controls.

c. Culvert construction and drift and bridge repair is carried on concurrently with embankment construction and involves the repair or replacement of damaged culverts and the installation of new culverts. Drifts and bridges are also repaired or replaced and scour protection provided.

The amount of roads proposed for rehabilitation are as follows:

SUMMARY OF ROADS SELECTED FOR REHABILITATION

PRESENT CLASSIFICATION

Region	District	Local Main	District	Feeder	Totals
Dodoma	Mpwapwa	112	301	230	643
	Dodoma	0	481	616	1,097
	Kondoa	155	247	136	538
	Subtotals	(267)	(1,029)	(982)	(2,278)
Singida	Singida	0	196	154	350
	Iramba	24	250	183	457
	Manyoni	0	82	486	568
	Subtotals	(24)	(523)	(823)	(1,375)
Kilimanjaro	Same	163	198	0	361
	Mwanga	93	127	102	322
	Subtotals	(256)	(325)	(102)	(683)
	TOTALS	547	1,882	1,907	4,336

2. Organization

While it would be ideal to organize a rehabilitation team for each district, the constraints of funds and trained personnel as they exist today in Tanzania preclude this. Four field rehabilitation teams are proposed centered at the following tentative locations, and to perform the indicated rehabilitation:

Region	Number of Maintenance Teams	Tentative Location of Center	Clearing and Shaping, Km	Surfacing, Km
Dodoma	2	Chenene, Handali	760	530
Singida	1	Ikungi	460	265
Kilimanjaro (Same/Mwanga)	1	Same	225	150
		Totals, per year	1445	945
		Totals, 3-year program	4335	2835

The total program is scheduled to complete 4,335 Km of clearing and shaping during 3 years, and 2835 Km of embankment construction and surfacing. Culvert, bridge and drift repairs are estimated at 17,280 m.

Local contractors have limited resources and consequently this rehabilitation work is proposed by an organization within MOW, maintaining a close association with the Regional Engineers and the Ministry of Works. A mix of labor-intensive and equipment-oriented construction is proposed as being most cost-effective and suited to the manpower skills presently available in Tanzania.

The organization of the teams is shown in Figures VII-12, VII-13, and VII-14. Essentially, each Rehabilitation Field Team will be headed by an expatriate engineer Team Leader supported by expatriate Mechanical and Equipment Operation Superintendents, all with local Counterparts, and supporting shops, office and the operating crews performing the rehabilitation work. Virtually each of the operators, mechanics and many of the skilled personnel will have a trainee assigned to him.

A Project Coordinating Team, to be based centrally, such as Babati, Arusha Region will be made up of a Project Coordinator; Highway Engineer; Highway Engineer/Training Supervisor; Parts and Supply Manager; and Office Manager. All of these expatriates will train an assigned Counterpart.

3. Training

Training will be an integral part of the rehabilitation program. During the rehabilitation, training will be provided for 7 engineers, 8 superintendents, 2 administrators, and 132 skilled personnel out of 272 locally hired individuals for the program.

On-the-job-training is proposed to be the predominant training mode, and the only practical means to suit the project needs and the needs of the regions involved. This will be supplemented with self-study and other training materials utilizing the expatriates as instructors. Training programs will be prepared and the presentation supervised for consistency. Progress of the trainees will be monitored and certifications awarded when competence has been achieved.

It is believed that ample numbers of sufficiently skilled personnel are available to form the nucleus of the rehabilitation teams, or that can become sufficiently skilled during the initial mobilization period. One need only observe the major repairs that are commonly made when breakdowns occur on the road to conclude that mechanical skills are indeed available.

Graduate engineers and technicians may be more difficult to locate. Some qualified technicians may be promoted to engineering positions to fill some of the counterpart positions.

The initial screening and selection of candidates will be extremely important and will involve considerable cooperation between the Project Coordination Team and the Regional officials as well as between the Field Rehabilitation Teams and the District officials. The preliminary evaluation and training of the individuals selected will also be important. It is believed that with cooperation, all the initial positions can be filled, although in some cases transfers from other regions may be required.

4. Costs

Summary costs for the three year program are given in Table VII-16. The U.S. $ costs are $18,374,505 (1980 cost) and with contingencies and escalation, the cost is U.S. $20,204,275. Local costs are T/Shs 65,377,796 and T/Shs 72,095,452 respectively.

5. Maintenance

A 3-year follow-on maintenance program is recommended, with expatriate engineers providing training and direction. The training program would continue with new trainees. The organization of the teams would remain largely the same, but would be called Maintenance Teams. At the end of the second 3-year period, the responsibility for the Teams would have evolved to the Counterparts and the Maintenance Engineer in the Ministry of Works. It is strongly recommended that this authority not be abrogated or delegated; otherwise the functions of highway maintenance, always vulnerable to being postponed, underfunded, undermanned and underequipped will again deteriorate.

The maintenance effort will commence as soon as the individual roads have been rehabilitated. Routine maintenance will be largely handled by labor-intensive methods, employing 4560 "maintenance contractors", each performing maintenance duties on an average of 1.5 km of roadway. Other functions, such as grading and resurfacing with granular material, will be performed periodically by the Maintenance Teams. At the completion of the rehabilitation program, the maintenance phase will be fully implemented and the Maintenance Teams will assume responsibility for the entire team area.

Total annual cost of maintenance is estimated at T/shs 49,234,000, but due to phasing in of maintenance requirements as rehabilitation is completed will actually total T/shs 31,621,680 during year 3, and T/shs 50,916,120 by year 6, the final year of expatriate support. After year 6, maintenance costs for the entire road network within the project districts will total the first figure above, without provisions for contingencies and escalation.

While these costs appear high, full maintenance effort is recommended to prevent investment loss and to allow the economic return of a maintained road system to become manifest. This follow-on maintenance should be funded by User Revenues as a pilot project, or additional funding requested from one of the donor agencies.

C. Other Recommendations

One of the great needs revealed by this study is that of a sound baseline data system for the development, preservation, and retrieval of economic and social information. Faulty data, incomplete data, or the complete lack of basic data were conditions that were constantly encountered throughout the study. These conditions not only delayed the data gathering and evaluation capability of the study team, but it also definitely restricted the ability to conduct a more thorough analysis. This situation is one which permeates all studies in Tanzania, and is thus a serious obstacle to realistic planning at any level of administrative responsibility.

As a step toward remedying this situation, it is recommended that a pilot study be undertaken for the purpose of determining the feasibility of establishing a baseline data system at the village level within the present study regions, with direct application to all regions within the country.

The types of data which lend themselves to compilation at the village level would include the following among others:

-- area of the village with the various types of land use
-- area harvested and production by volume and value for each crop
-- quantity and value of individual crops marketed
-- quantity, value and type of agricultural inputs purchased for use within the village area
-- number, capacity, and type of village farm infrastructure such as milling machines, godowns, cattle dips, diesel pumps, windmills, etc.
-- livestock population by species
-- number and species of livestock marketed
-- number and species of livestock slaughtered
-- number and species of livestock deaths from causes other than slaughtering
-- type and capacity of water supply for livestock and domestic use
-- population and number of families
-- number of births and deaths
-- number of schools, students, and teachers by levels of education, public and/or private
-- number and type of health facilities and medical personnel
-- rainfall records

-- water level records at prefixed observation points

It is contemplated that the data compiled at the village level would be forwarded to a field officer (data bank) established within each of the administrative divisions. The data at that point would be cross checked, verified, and consolidated into the administrative division level, but without loss of the individual village input. A field officer at the administrative division level, with responsibility for evaluating and verifying data from an average of about 16 villages, is in a much better position to do such verification than a district office which would have responsibility within the present study regions of approximately 93 villages. Once the verification is complete, the data would then be forwarded to the district offices, and from the district to the regional offices, with consolidations taking place at these two levels as well. The data would thus be available as the base for quarterly or annual progress reports, special reports, planning forecasts and other uses. The basic reporting period would be annually, although some of the data could be filed on a quarterly basis if the need were there, and the data were adaptable to those time periods.

This baseline data reporting system should be closely coordinated with the Bureau of Census, and with other ministries such as Kilimo which have agricultural extension agents stationed at numerous villages throughout the regions.

For the purpose of supplementing the above village level baseline data system, the study's Social Anthropologist presents in the following paragraphs, the present unsatisfactory status of the sociological data, and a specific recommendation to improve this condition.

> "Sociological data for the areas of concern is limited as it is for all of Tanzania. That which is available (in the form of ethnographic studies by anthropologists, colonial records, travelers reports, etc.) is written from so many different points of view that comparison is difficult and comparable data from several areas usually non-existent. Anthropological and sociological studies, considered alone, provide only a sketchy and incomplete overview of the cultures of the areas. Some areas have been relatively well researched and reported on while others have been reported on in only the most sketchy fashion. Thus, there are no systematic data available in libraries which can be used as a social baseline from which changes, receptivity, resistance, and other aspects can be understood and/ or predicted. In addition, anthropological reports are typically

written in the "ethnographic present" tense, meaning the time at which the specific field research was conducted. This is an appropriate procedure in many instances since historical data are either absent or extremely difficult to obtain through written or oral sources. The consequence however is the lack for the most part of historical depth in those anthropological writings that do exist on the traditional societies and cultures of Tanzania.

A specific recommendation which would help remedy this lack of social data and which would be feasible is for the University of Dar es Salaam to continue the practice of requiring undergraduate theses in sociology and other social science disciplines which are based on first-hand field research in rural communities (usually the home area of the student writing the thesis). Based on a review of several of these theses at the University of Dar es Salaam, it is apparent that the current situation provides a great deal of needed assistance in understanding the nature and structure of rural communities. However, the theses have for the most part been written by individuals who have not had a single framework or overall goal in data collection. It would be possible, and perhaps appropriate to give consideration to the development of an overall, unified scheme for social science theses to be written at the University. If data were collected with a common theoretical orientation, with the goal of providing answers to a specific set of questions, with an effort to cover most or all of the country, and with a schedule for up-dating systematically, there would be a highly useful core of information which could be of considerable assistance to development planners within the country and to foreign donor organizations. The alternative of relying on either foreign researchers and/or university professors within Tanzania is unrealistic given both cost and time considerations. University students, if properly trained for the fieldwork, could rely upon their own previous experience in the communities in which they grew up. This would continue to give them first-hand fieldwork in rural areas as part of their university education, which has been deemed appropriate both by the university and in line with national service guidelines. It would be, as well, much more efficient and less costly than using foreign researchers and/or university professors. Foreign donors, which along with the Tanzanian Government, often suffer from the lack of adequate social baseline data might give consideration to the possibility of underwriting part or all of the cost of collecting this social baseline data. During the present period, which is one of rapid social change in Tanzania, a better understanding of the social baseline would be of considerable benefit in understanding and planning for future development programs and in assessing both current and planned programs. It is regrettable that adequate social baseline data do not currently exist and it is strongly recommended that serious consideration be given to appropriate means to alter this situation."

Additional serious data gaps which need be filled is that of traffic count data for the highway network, and the establishment of a highway identification and numbering system and a highway inventory. It is simply impossible to do adequate highway planning without the essential tools.

Traffic counts, highway identification and numbering and highway inventory are a major portion of these essential tools.

A full assessment of benefits for the present rural access road study could not be made because of lack of historical or present traffic count data on any of the networks. The same is true of the Trunk Road system, which has no continuous series, but merely a sporadic study here and there as particular segments are being considered from time to time for improvement.

Similarly the establishment of a highway identification and numbering system, even if it must be on an individual region basis, would be far superior to the existing, chaotic situation in which most of the highways within the regions have no identification numbers. All of the roads included in the present study are identified only by village names. This is certainly not a stable situation because many times the village names have been changed, the spelling is changed or in error, and a number of villages will have the same name in a common district or region. In addition, the current maps (1978 edition) reflect this incorrect information. Many village names are missing entirely from the maps, or are misspelled.

No readily available lists of roads were found throughout the nine districts and the three regions comprising the study area. Upon inquiry, most district and regional engineers had to begin the preparation of such lists from scratch. The result was that errors were discovered by the consultant's engineers during their review of the lists in the field following inspections over a portion of the roads. The available road maps are also incomplete and in error in terms of road locations and the existence or nonexistence of some roads. In addition, the preparation of the lists by a number of the District Engineers' offices required several weeks and a substantial amount of followup by the consultant's engineers. Finally, the end product itself cannot be assumed to be a complete inventory of all rural access roads in the study areas. That can only be determined by doing extensive field work, not only in locating and correctly identifying all of the roads, but also in compiling the essential road inventory information about each of the roads. In the absence of a detailed highway inventory, information regarding the nation's highway network is based largely on estimates.

II PHYSICAL AND HISTORICAL BACKGROUND

A. Introduction

1. General

The emphasis in recent years in Tanzania has been on rural development as one of the means of reducing inequalities in income distribution. As part of this philosphy, the Government in 1972 instigated decentralization of many administrative functions including roads to the 20 administrative regions and their districts. Decisions on priorities for roads, including planning, rehabilitation and maintenance are generally made at the District level. The Regions provide technical support, as does the Ministry of Works in Dar-es-Salaam.

The Ministry of Works (MOW) was separated from the Ministry of Communications and Works in 1974 and retained responsibilities for equipment and for construction and maintenance of trunk roads. MOW allocates construction and maintenance funds and equipment to the Regions and delegates authority for the actual trunk road maintenance. Funds for the maintenance of other roads are provided from regional budgets.

Decentralization has raised several problems. First, already scarce manpower and equipment resources were further dispersed, to the point in some regions where the organizational shell has no substance and is ineffective. Secondly, funds are far too easily diverted from road work to other equally pressing needs. Equipment is also diverted to other assignments. Finally, responsible personnel are transferred frequently; continuity of programs and projects are often lost with such transfers and many months are required before the transferred engineer acquires familiarity with his new area.

The secondary and tertiary road system has not been adequately maintained for several years and is deteriorating. This has been due to inadequate funding, diverted funds and ineffective organization due to manpower and equipment deficiencies. The primary objective of this project is to provide assistance in correcting these deficiencies.

2. Objectives

The objectives of the study include the following:

a. Provide a capability to rehabilitate and maintain low cost rural access roads in the regions of Singida, Dodoma, and the districts of Mwanga

and Same in Kilimanjaro Region and assist in the construction of a designated quantity of roads to insure that the districts are more accessible to rural development programs and social services.

b. To encourage commerce by reducing travel costs and travel time for people and goods.

c. To improve the administrative, planning, construction and maintenance capacity of the region and district road organizations.

d. To increase access opportunities for small farmers of the three regions to the agricultural inputs and services required for increased agricultural production.

3. Scope of Work

a. Technical

The scope of work includes the following as part of the Technical Analysis:

(1) Review the geometric and structural design criteria, the standards normally used in construction, the axle loading standards, and projected traffic and recommend modifications which may be necessary to meet project objectives in the most economic manner.

(2) Identify only major reconstruction or rehabilitation activities resulting from imposition of the recommended roadway criteria.

(3) Review and update information on roadway and material sources within the project area, as previously prepared by Lyon Associates for USAID and COMWORKS in 1972.

(4) Establish typical criteria for stream crossings and examine the adequacy of district standards for such structures and recommend any necessary changes.

(5) For roads to be upgraded, review the existing bridges for adequacy to pass the projected traffic and axle loads and recommend any needed improvements.

(6) Investigate the appropriate construction techniques to be used, as related to the proportion of capital equipment, labor and simple tools for the proposed construction as rehabilitation. Recommend pertinent changes or mixes required to meet project objectives at the least cost.

(7) Prepare a schedule for the rehabilitation and construction of roads for the proposed implementation phase.

(8) Develop a system for overall selection and project prioritization for the roads to be included in the project. Such a project selection and prioritization scheme was developed in very substantial detail, and was coordinated but not subsumed to the road priority needs of the District Engineers of each of the project districts.

(9) Investigate existing regional Ministry of Works facilities for roadway construction and maintenance and evaluate the capacity of the Government to administer, construct and maintain the existing and proposed facilities to be implemented under this project.

(10) Review the organizational structure of the Regional offices, indicating the existing and anticipated level of staffing required, and both type and number of administrative and technical staff training required to insure the requisite absorbtive capacity to achieve the project objectives.

(11) Recommend an appropriate equipment listing for the administrative, construction and maintenance acitivities.

(12) Evaluate the TanGov financial capability to fund the recurrent cost for both administrative and maintenance subsequent to the implementation of the project.

(13) Investigate and advise as to local contractor capability to undertake construction or maintenance for portions of the project, making alternative recommendations of possible methods to be used for contractural roadway construction or rehabilitation.

(14) Develop and recommend an implementation plan for the project, indicating the number and type of supportive administrative and technical specialists required, duration of their respective assignments, phased ordering of equipment and spare parts, etc. and overall cost estimates.

(15) Provide an environmental assessment.

(16) Visit and review Arusha Planning and Village Development Project roads activity and Ministry of Works capability development in relation to the Arusha project and compare findings and recommendations.

b. Socioeconomic Analysis

The terms of reference for the economic and social analysis called for an internal rate of return analysis which was to include both user benefits and agricultural benefits.

An internal rate of return was calculated for the project based upon agricultural benefits (producer surplus), but it was not possible to calculate user savings (of non-agricultural benefits), since there were no present or historical traffic data for any of the rural access roads in the study. 1/

The producer surplus methodology reflecting costs and margins under smallholder traditional agricultural crop husbandry versus improved methods included the following benefits as detailed by the Scope of Work:

(1) reduction in the costs of the farm inputs and other goods,

(2) improved access for agricultural extension services,

(3) increase in farm family income from improved market access and from projected investments in agriculture in the area of influence of the roads.

In addition, employment benefits were quantified.

A discussion of the indirect social benefits and cost savings to be derived from the project were called for by the Scope of Work, and included:

(1) expanded educational opportunities for school age children and adults,

(2) easier access to health facilities,

(3) greater likelihood of involvement in community development activities, particularly rural water supplies and self-help school construction,

(4) potential cost savings in the provision of essential government services,

(5) impact on role of women in community development activities.

All of the above and many more indirect social benefits (and a few possible disbenefits) were identified and discussed throughout the study.

4. Project Methodology

a. Technical

Field work was initiated early in the investigation to gather economic and social data and to evaluate district and regional capabilities for road rehabilitation and maintenance. The first trip extended from 16 January

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1/ One cannot apply both user benefits and producer surplus to the same agricultural traffic. This would be a duplication of benefits.

to 22 February, 1980 and involved travel to all districts in the three regions as well as to Arusha Regional Planning and Village Development project in Arusha. A second field trip to Singida and Dodoma Regions occurred between March 3 and March 13. A third trip to the Kilimanjaro and Arusha Regions by charter aircraft took place between 21 March and 25 March. Two additional field trips were conducted by the social anthropologist; the first was from January 2 to January 8 to Kilimanjaro and the second was from March 11 to March 25 to Dodoma and Singida Regions.

The team interviewed each Regional Development Director and the Regional Development staff. The Regional Engineer and members of his staff were also interviewed and the shops and equipment were inspected. Inventories of equipment and list of manpower were provided when available.

Design standards were reviewed. These are presently being revised and a draft version was provided by the MOW. Although each Region is free to adopt their own standards, each Region and District stated they attempted to conform with MOW standards at least as regards new construction.

The team inspected over 2200 kilometers of roads in the project districts in preparing a detailed road inventory for part of the roads in the networks. These lists were augmented by the District Engineers for the other roads in each District, particularly those that were included in their rehabilitation priorities.

The present condition of the road sections were appraised, maintenance practices observed and the maintenance level evaluated. More or less typical road sections, or those that were suggested by the District staff, were selected for inspection. On the later field trips, candidate roads identified in the preliminary prioritization were also included among the road sections inspected.

Construction techniques are proposed for the implementation phase which are based on current maintenance practice, the available equipment, manpower, availability of labor, project road lengths and costs. Interviews were conducted at all levels in each district and region to determine MOW capabilities and to devise the best approach to solving their road rehabilitation and maintenance problems.

The Arusha project staff were interviewed to determine the status of the Arusha Planning and Village Development Project. The experiences of the staff on other access roads in Arusha Region were described and

design standards evaluated.

Finally, a rehabilitation scheme was devised including defining manpower and training requirements, expatriate advisors and required equipment. Schedules were prepared for the various rehabilitation activities and costs determined. Provisions and schedules for on-going maintenance were prepared. A financial assessment of the Government to cover recurrent costs was also briefly considered.

b. Socioeconomic

The magnitude of the scope of this study, involving three regions with a combined area of 98,589 square kilometers, a population of 1,794,000, and rural access roads ultimately determined at 7,095 kilometers with limited access in many areas, dictated that an innovative approach be utilized in the project evaluation in order to reasonably accomplish the objectives sought.

The approach adopted by the consultant after discussions with officials of USAID Tanzania and Washington, and the Tanzanian Government was to establish an evaluation, selection and prioritization scheme reflecting social and economic factors at the micro-level of analysis (administrative division) with an internal rate of return analysis at the overall project level (macro) with possible application at the regional level to the extent feasible.

Major effort of the economics and social analyses was placed upon the micro-level of analysis, since the selection and prioritization scheme utilized in this study allows a welding together of the social as well as the economic benefits. This is in contrast to an internal rate of return analysis, in that in the latter, no real consideration is given to social factors. Only lip service is offered under the IRR with all social benefits classified as unquantifiable. Field work, by the economists and the social anthropologist confirmed the assumption that social benefits from low-volume rural access roads in Tanzania (which serve predominantly subsistence smallholders) may be nearly as important in the opinions of the smallholders as the economic benefits.

The administrative division, of which there are 54 in the 3 study areas, served as the base unit for developing the micro-data and other information. Plates IV-3, IV-4 and IV-5 show the Administrative Districts and Divisions for Dodoma Regions, Singida Region, and Same/Mwanga District of Kilimanjaro Region, respectively.

Although working at this level of analysis required a staggering data compilation and statistical task, the multiplicity and geographical dispersion of the rural access roads throughout the nine districts of the three study regions necessitated this level of operation in order to provide meaningful data for the road selection and priority scheme. One reason for the magnitude of the data compilation task is that the agricultural crop and liv stock records of purchases by the parastatals are at the individual village level, with only a portion of the records identifying villages by wards and administrative divisions. The village is the legal entity in transactions involving economic and other matters, and within the three study areas, ther are 863.

Data on six economic and five social criterion were developed for the project selection and prioritization scheme. The economic factors included: annual average livestock sales, annual production of forest products and fish, annual small industry sales and agricultural potential. The social factors were: population, population density, education, health, and rural water supply. The basic steps in developing the project selection and prioritization scheme consisted of the following:

(1) Development of criteria for preliminary screening of roads (elimination of unacceptable candidates at the beginning).

(2) Development of preliminary economic and social data for a few key indicators, which would permit a preselection of road groups by administrative divisions for followup field work by the engineers.

(3) Development of the Rating Scheme for final screening. This included: finalization of the input matrix, determination of the relative weights, calculations of the ratings of the administrative divisions, application of the weights, and finally, the determination of priority rankings.

The administrative divisions were ranged on a priority basis within each region, while priority ratings developed by the District Engineers of each of the nine districts were utilized to determine the priority of the individual roads within each division.

The internal rate of return analysis utilized in this study was that of a modified version of the producer surplus approach with application to the overall road project.

The major agricultural benefit associated with the rural access road improvement program is that of incremental agricultural output identified primarily with increases in productivity on lands now under cultivation.

Benefits of employment were also calculated from employment arising primarily from the maintenance program associated with the road improvement project. A substantial analysis was completed in terms of identification of various social benefits and anticipated impacts of the benefits or (disbenefits) as a result of the road improvement program. A key element in this analysis was field visits to 12 selected villages throughout the three areas of concern, Dodoma, Singida, and the Same/Mwanga Districts of Kilimanjaro Region.

B. Physical Setting

1. Physiography

Africa is the second largest continent, after Eurasia, having an area of 11,700,000 square miles. It has been described as a huge crystalline mass surrounded by a sedimentary fringe. The major part of the continent consists of broad swells or plateaus separated by wide basins. Precambrian rocks outcrop in about one third of the continental area, on the plateaus and swells. The basins are both tectonic and topographic features and are filled with thick deposits of sediments derived from the surrounding highlands.

The Rift Valley system of eastern Africa is the most important structural and physiographic feature of tropical Africa. It extends circuitously, with several branches, from Mozambique through Tanzania, Kenya and Ethiopia to the Red Sea. The total length exceeds 1,800 miles. The fault pattern in Northern Tanzanian and Southern Kenya is shown in Figure I-1.

One third of the continent has no drainage to the oceans or the Mediterranean Sea. Most of the remainder is drained by a few major rivers. The Nile is the only perennial stream which flows into the Mediterranean from Africa. The major rivers in eastern Africa are the Zambesi, the Ruvuma, the Ruvu and the Rufiji. These rivers drain into the Indian Ocean.

Tanzania covers an area of about 940,000 square kilometers. The elevation rises gently from the narrow coastal plain, which varies from 20 to 60 kilometers in width, to the great Central Plateau which comprises the greater part of the interior of the country. Isolated mountain ranges are scattered throughout the country, such as the Usambara Mountains in Tanga Region, the Pare Mountains in Kilimanjaro Region, the Uluguru Mountains in Morogoro Region and the Southern Highlands in the southwestern part of the country. Highlands are also associated with the western Rift Valley, extending from the Mbizi Mountains along the eastern shores of Lake Tanganyika to Kigoma. Large volcanic centers also occur, such as Mount Kilimanjaro, Mt. Meru, and Oldonyo Lengai in the northern part of the country. Hanang forms a volcanic center further south. Mount Rungwe lies in the midst of another large volcanic center which extends southeast from Mbeya almost to the northern end of Lake Nyasa.

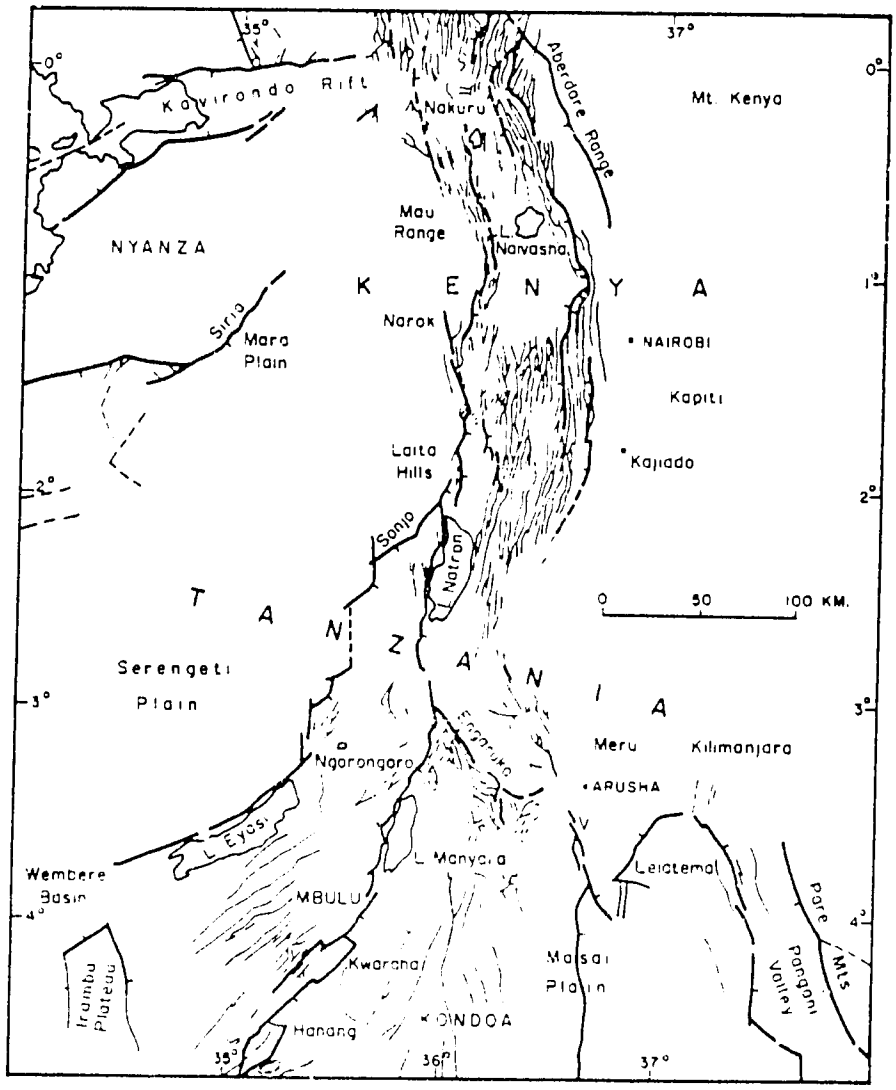

FIGURE II-1

FAULT PATTERN IN SOUTHERN KENYA AND NORTHERN TANZANIA 1/

1/ Baker, B. H., Mohr, P. A., and Williams, L. A. J., 1972: Geology of the Eastern Rift System of Africa, Geol. Soc. Am., Spec. Paper 136, 28 p.

The Central Plateau for the most part maintains an elevation of over 1000 m in Tanzania. It is well defined along its western boundary by the trough of the western Rift Valley system which includes Lakes Tanganyika and Nyasa. Escarpments border along much of the eastern boundary with the coastal plain.

Dodoma and Singida Regions lie within the Central Plateau. The Rubeho Mountains are situated in the southeastern part of Dodoma Region, largely within Mpwapwa District. The Bahi depression, with an elevation generally under 1000 m is an elongated basin along the Singida and Dodoma boundary. It is a former lake bed in which aggradation is presently occurring.

The eastern Rift System lies slightly to the east of Singida and extends in a northeasterly direction. Another branch of this Rift system passes through Lake Eyasi and the Wembere depression. The Iramba Plateau, which is bounded by this scarp to the west, is also bounded by steep fault scarps to the east and north. The remainder of the two regions is largely rolling plateau.

The southeastern part of Kilimanjaro Region consisting of Mwanga and Same Districts is distinctly different from the rest of the region which is dominated by Mount Kilimanjaro. Mwanga and Same Districts contain the Pare Mountains and surrounding lowlands. The Pare Mountains, like the adjacent Usambara Mountains to the southeast are elongated fault blocks which appear to follow a southeasterly trending tectonic line entending from the Mt. Kilimanjaro area. They are elevated blocks with a northeasterly dip. The district boundary to the west is the Pangani River which flows in a fault trough between the Pare Mountains and another scarp to the west.

2. Climate and Vegetation

Generally speaking, there are three climatic zones in Tanzania:

a. The hot and humid coastal region with a mean annual temperature of 76°F and two rainy seasons between October and June.

b. The hot and arid Central Plateau with low humidity and low rainfall (500 - 1000mm/year). There are considerable climatic variations within this zone.

c. The semi-temperate areas of the major mountain system, such

as Kilimanjaro, Meru, the Crater Highlands to the west, the Southern Highlands, Usambara Mountains, and to a lesser extent, the Pare Mountains. Temperatures are considerably lower and rainfall considerably higher.

Dodoma and Singida Regions fall in the hot and arid zone of the Central Plateau. Variations occur, particularly in Mpwapwa District, but most of the remainder of these regions have between 400 and 800 mm rainfall annually, which is low for a tropical country.

Same and Mwanga Districts also have low rainfall, or between 400 and 600 mm annually except over the higher elevations of the Pare Mountains where over 1000 mm of rain may fall. Most of the mountainous areas receive at least 800 mm annually.

Table II-1 presents the total rainfall for stations that are considered representative of most of the districts in which they lie. No station is given for Mwanga District, but the two in Same District are considered representative of Mwanga District as well. The two stations illustrate the variation of rainfall with elevation; Makanya lies on the surrounding lowlands while Suji mission is in the Pare Mountains.

Table II-2 shows the rainfall distribution and the variation in rainy season among the stations. The rains begin at each location in November with heavy rains continuing through April at several stations. Table II-3 provides an indication of trafficability and will be discussed in part B.7 of this section (II).

The mean annual rainfall for stations in each region is given in Table II-1. Table II-2 shows the mean annual and mean monthly rainfall for 1978 which was a relatively high-rainfall year at most stations. Table II-3 provides the number of days per year when rainfall exceeded 25 mm, 50 mm, and 75 mm for several years.

TABLE II-1

Mean Annual Rainfall

Station No.	Identification	Years of Record	Mean Annual Rainfall, mm
96.3600	Mpwapwa Agricultural Station	49	701
96.3501	Dodoma Meteorological Station	52	559
94.3515	Masange, Kondoa	25	743
95.3400	Manyoni District Office	47	644
94.3401	Singida District Office	50	672
94.3417	Kiomboi Administration Building, Iramba	16	830
94.3701	Makanya, Hasani Sisal Estate, Same	37	501
94.3704	Suji Mission, Same	38	864

TABLE II -2

Mean Monthly Rainfall, 1978

Station Identification	Mean Annual	Mean Monthly Rainfall, mm Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1978 Total
Mpwampwa	701	135.9	160.1	176.2	89.7	9.3	-	-	-	-	-	36.9	239.8	897.9
Dodoma	559	61.1	48.1	111.8	67.4	5.7	-	-	-	-	-	42.9	169.7	506.7
Masange	743	306.5	72.1	265.2	95.9	40.0	-	-	-	-	-	184.1	199.1	1167.1
Manyoni	644	73.8	113.7	274.9	38.5	-	-	-	-	-	-	128.6	260.1	889.6
Singida	672	96.3	98.8	202.4	55.5	-	-	-	-	-	-	83.9	142.7	688.4
Kiomboi	830	165.0	142.2	50.3	356.0	46.2	-	-	-	-	13.3	111.4	46.2	-
Hasani	501	103.8	38.0	366.2	88.6	16.8	10.6	6.9	6.4	-	-	131.6	152.4	928.6
Suji	864	194.4	47.6	402.8	178.1	45.4	18.2	0.4	-	1.0	10.1	389.7	310.8	1598.5

TABLE II-3

Number of Days/Year Rainfall Exceeds 25, 50 and 75 mm

Station Identification	For Years 1978 Total	25	50	75	1973 Total	25	50	75	1971 Total	25	50	75
Mpwapwa	897.9	9	1	–	700.5	2	Incomplete		650.4	5	–	–
Dodoma	506.7	6	1	–	529.0	4	Incomplete 3	–	608.5	6	1	–
Masange	1167.1	16	1	1	526.6	2	Incomplete 1	–	–	3	–	–
Manyoni	889.6	11	2	–	659.2	10	1	–	584.9	7	2	–
Singida	688.4	10	–	–	612.0	11	2	–	539.6	3	–	–
Kiomboi	–	10	4	–	819.7	5	–	–	729.6	7	1	–
Hasani	928.6	10	4	–	322.9	1	–	–	780.0	–	–	–
Suji Mission	1598.5	21	5	2	656.3	3	–	–	–	–	–	–

The small seasonal variation in temperature is exceeded by the diurnal range which is greatest over the Central Plateau where it can be as much as 20°C and least along the coast where it is about 8°C.

Bushland and thicket interspersed with large cultivated areas are the major vegetation types in the Dodoma and Singida Regions. Some forested areas occur in the Same District. Bushland and thicket is composed principally of dense shrubs and small trees with perhaps a ground cover of grass. This is the predominant vegetative cover in the more arid regions. Wooded grasslands are located mainly along the flood plains of the major rivers.

3. Geology

a. General

The rock types that occur in Tanzania are typical of much of tropical Africa. Most of the country consists of Precambrian rocks which have been divided into two major systems. The Paleozoic is represented by the Karroo Series of rocks which are found in the eastern part of the country. A narrow band of Mesozoic and Cenozoic sediments occur along the coast and Recent and Quaternary sediments are common in the interior basins and drainageways.

The Rift Valley system has had a major influence on the geology as well as the topography of western and north central Tanzania. This influence was not limited to the major rift faulting which occurred. General large-scale uplift preceded the faulting, producing the broad plateaus. Volcanic activity was also associated with the Rift faulting; in Tanzania this apparently began after the faulting was initiated. Most of these volcanoes are now considered extinct or dormant, but a few are still active.

The widespread Tertiary erosional surfaces common throughout Africa are also found in Tanzania. These are of particular significance because they are important possible sources of materials. Extensive concretionary or indurated ironstone has developed on most of these surfaces and many of these deposits have been preserved. The most extensive is the mid-Tertiary surface, sometimes called the African Surface. The major locations include the greater part of the central plateau from Dodoma to Lake Tanganyika. The main Serengeti Plain and the Masai Steppe are part of this surface, as is the main surface of the southern central region. In the south it is found around Songea and extends easterly across the Karroo sediments into the coastal region.

b. Stratigraphy

The rocks of the Dodoma System of Precambrian age are the oldest in Tanzania. These are coarsely crystalline metamorphic rocks such as schist, quartzite, amphibolite and hornblende-gneiss, acid-gneiss, and other types of gneiss. Migmatites also occur and granite is widespread. The Dodoma Series is found in the west central part of the country, principally in the Tabora, Mbeya and Iringa Regions with scattered outcrops in the southern part of the Dodoma Region.

Quartzites and volcanics compose the Nyanzian System which overlies the Dodoma System in the northwestern part of the country. Principal occurrences are in the Mara, Mwanza, Shinyanga and Singida Regions. The principal rock is a "banded ironstone". The volcanics have been slightly metamorphosed.

The Kavirondian System is associated with the Nyanzian; both may be considered Middle Precambrian. This System is made up principally of conglomerates, feldspathic sandstones, quartzites and volcanics. Both systems have been largely intruded or altered to granite or granodiorite. This granitic rock is widely exposed from east of Dodoma to west of Mwanza and from the Kenya border as far south as Njombe.

Metamorphosed sedimentary and volcanic rocks make up two complementary systems. The Usagaran System is found in the eastern part of the country, in most places in contact with the granite mentioned above on the west and extending as close as 40 kilometers from the coast. These rocks continue into Kenya in the north and Mozambique in the south. The Ubendian System occurs in the west, between Lake Tanganyika and Lake Nyasa. Both Systems are made up of a wide variety of metamorphic rocks including marble; quartizite; graphitic schist; hornblende; biotite- and garnet-gneiss; acid-gneiss; granulite and charnockite.

Marine limestones, mudstones, sandstones, shales, conglomerates and marls occur in a narrow irregular strip along the coast. These penetrate up to 150 kilometers inland. The rocks are Jurassic, Cretaceous, Tertiary and Quaternary in age. No marine rocks are found west of this belt.

Continental sediments of Cretaceous, Tertiary and Quaternary age

occur inland. The older sediments, found in the Mbeya and Tabora Regions, are mainly sandstones and sands. In the central and northern regions, limestone, silt and other continental sediments were deposited in lakes and shallow basins formed by the warping of the surface which occurred during the Rift faulting. The remains of early man found in Olduvai Gorge were in Pleistocene lake beds.

It is believed that volcanic activity began in late Cretaceous time, associated with the Rift Valley faulting. There were two major centers. The activity in the south was at Mount Rungwe and the Poroto Mountains southeast of Mbeya. In the north the volcanics produced Mount Kilimanjaro, Mount Meru and many others to the west and south including Mount Hanang near Babati. The volcanic activity extended into Kenya and Ethiopia. The rocks are typically alkaline volcanics: olivine basalt, alkali basalt, phonolite, trachyte, nephelinite and extensive pyroclastics such as tuff and ash.

Other intrusive rocks occur in Tanzania, but these are, for the most part, small. These include gabbro, anorthosite, syenite, eclogite and ultrabasic rocks. Carbonatite bodies and kimberlite pipes are also located within the country.

4. Soils

The soils of Tanzania are complex and variable. Most of the soils are lateritic or partially laterized. Under the pedological system used by D'Hoore (1964)[1/] the three principle tropical soil types in Tanzania were ferruginous soils, ferrallitic soils and ferrisols. This system was adopted by Lyon Associates in their African soils study (1971) [2/] because it was found that the terms correlated well with the physical properties of the soils. These terms were also used in the Tanzania Highway Maintenance and Organization Study completed in 1972 by Lyon Associates.

The FAO compiled a more recent pedological map of Africa that was published in 1973 which is based on a classification system which is a compromise of several systems.

1/ D'Hoore, J.L, Soils Map of Africa, Scale 1 to 5,000,000, Explanatory Monography; Publ. 93, Comm. for Tech. Co-op. in Africa, Lagos, 1964.

2/ Lyon Associates, Inc., Laterite, Lateritic Soils and other Problem Soils of Africa, Final report for Agency for International Development, Contract AID/csd-2164, 1971.

There are 25 soils units [1/], but many have limited distribution. Traditional pedological terms such as chernozems, podzols, planosols and lithosols have been retained. Recent terms which have become popular are also retained such as vertisols, andosols and ferralsols. As with the New Soil Taxonomy of the U.S., the terms laterite and lateritic soils have been eliminated.

Definitions are given below only for those soils which represent the major soils of Tanzania, including the red tropical soils, the black clays, and the volcanic soils. The definitions are taken in part from the FAO map.

a. Acrisols are very acid soils with an illuvial accumulation of clay in the B horizon. Certain types have a plinthic horizon within the upper 1.25 m of the surface. Plinthite is an iron rich mixture of clay and other constituents that hardens irreversibly to an ironstone hard-pan or concretions on exposure to repeated wetting and drying. Ferric acrisols with associated plinthic acrisols are the predominant soils in central and west-central Tanzania, including Singida and Dodoma Regions. A ferric acrisol is one in which discrete nodules or concretions or indurated horizons commonly occur.

b. Luvisols are soils which have an illuvial accumulation of clay in the B horizon, as do the Acrisols, but in which clay illuviation is not considered to be the dominant soil forming process. Ferric luvisols with associated plinthic luvisols are the predominant soils in the central part of western Tanzania and in the Masai Steppe.

c. Nitosols are soils having an argillic B horizon which may be deeply weathered but which have not reached the degree of maturity in weathering of the Acrisols, Luvisols and Ferralsols. Nitosols have not developed plinthic or ferric horizons. Nitosols occur principally in the area of the Pare Mountains and the Usambara Mountains; in Mpwapwa District; north and northeastward from Singida to Lake Natron; in the Southern Highlands; and in scattered areas in northern Tanzania.

d. Ferralsols contain a high sesquioxide content in the clay fraction

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1/ FAO (Food and Agriculture Organization of the United Nations), Soil Map of the World, Vol. 1, Legend, Unesco, Paris, 1974.

which may be composed largely of kaolinite with silica. A plinthite horizon may occur. Ferralsols occur primarily in the higher rainfall regions of southeastern and northwestern Tanzania.

e. Cambisols are soils in which changes in color, structure and consistency have occured due to weathering of the soil profile. Cambisols are widespread from the Tanga Region southwestward to Lake Nyasa; north and northwest of Iramba District in Singida Region; and along Lake Tanganyika.

f. Vertisols are black or dark gray clay soils or brown heavy textured soils that shrink and swell with changes in moisture content. These are often termed "black cotton soils" and are found in isolated topographic depressions throughout central Tanzania. They are particularly prevalent north and northwest of Singida Region.

g. Andosols are soils formed from materials rich in volcanic extrusives, especially glass, and having a very dark surface horizon. These are common soils in volcanic regions; generally the bulk density is low; moisture content is high and there may be considerable amorphous material. In Tanzania these soils occur over the volcanic rocks north of the Arusha area; and northwest of Lake Nyasa in the Southern Highlands.

h. Fluvisols are alluvial soils common along existing streams such as the Wembere River and Lake Eyasi along the northwest boundary of Singida Region and in the Bahi Swamp area. These are generally eutric fluvisols, meaning fertile (Gr. eu, good, eutrophic, fertile).

5. Relationships of the Physical Setting to Road Development

The major problems in road location are terrain, rainfall and soil conditions. Often these are related. The higher rainfall tends to occur at higher elevations, and among the various soil-forming factors, the soil type that forms is most influenced by rainfall.

Soil type and rainfall have also played an important role in agricultural development. The Pare Mountains with their elevated rainfall, cooler climate and relatively deep soil development (for a mountainous area) provide good soil and climate for certain crops. The Rubeno Mountains in Mpwapwa District on the other hand have less rainfall, shallower soil development and are generally populated in the valleys where the fertile soils occur.

Road development in the Pare Mountain has occurred despite the difficult terrain because of the agricultural potential. Problems in construction have included steep grades, earth and rock excavation, slope stabilization and erosion. Road development in the Rubeho Mountains has been generally restricted to valleys where excavation problems have been minor and where rock excavation is rarely required.

In all parts of Dodoma and Singida Regions rainfall is often intense. This is characteristic of tropical storms and storm damage to roads and bridges is a common occurrence. This is particularly true when maintenance is lacking, because if ditches and drainage structures do not function, erosion of the roadway almost certainly follows and considerable damage can occur in one severe rainstorm.

The soils in much of Dodoma and Singida Regions are particularly susceptible to erosion. They are generally loamy sands or sandy loams that contain insufficient fines to provide cohesive resistance to erosion and the tractive force of flowing water. Erosion protection at all structures is important and many problems with bank erosion have occurred in these regions.

Unstable soils that occur in topographic depressions are, after washed-out or non-existent stream crossings, the next most common reason for roads being closed to traffic. These "black cotton" clays or silty clays swell with moisture provided by rains, lose strength and become slippery. Heavy vehicles easily bog down.

The soils in Dodoma and Singida Regions as well in the Mwanga and Same Districts of Kilimanjaro are, for the most part, sufficiently granular that trafficability is not a major problem except during heavy rain. Many roads can be traveled year-round that have little or no surfacing material. Many others are affected for relatively short periods during the rainy season

Some indication of trafficability is provided in Table II-3. The number of days per year that a road is likely to be impassable is impossible to predict because it is dependent on many factors such as rainfall intensity and duration, the type of soil, the time between rains, number of vehicles and axle loads, drainage and wind, among other factors. For a few vehicles per day, say less than 5, perhaps up to 50 mm rainfall may occur before an earth road with an essentially granular subgrade becomes impassable. In clay

soils, 25 mm may be the maximum for 5 vehicles. Observations on trafficability with rainfall should be conducted for low-volume roads. If surfacing can be delayed until such time as traffic and access problems require, premature expenditures could be prevented.

C. Historical Setting

1. Political Aspects

The United Republic of Tanzania became an independent country in 1961. Prior to World War I, mainland Tanzania was a part of German East Africa (which had also included the present countries of Rwanda and Burundi). In 1920, the League of Nations assigned Tanganyika Territory (mainland Tanzania) to the British who administered it from the 1920s to the early 1960s in a manner similar to that used in other countries of the British Empire. Two differences between the British administration of Tanganyika and certain other colonies are worthy of note since they have significantly affected the country's present characteristics. These differences are: (1) the typical British policy of using indigenous native authorities for colonial administration was not as easily applied in Tanganyika as it had been in some other countries (e.g., India, Nigeria) due to the presence of more loosely structured societies, with the consequence that the British were often forced to "create" chiefs in Tanganyika and an administrative infrastructure where none had existed previously; and (2) Tanganyika was never a colony but always remained a protectorate, resulting in relatively less internal development of the country by the British than for full colonies like Kenya and Nigeria. The "raw materials" which independent Tanzania used to build its governmental infrastructure were the legacy of the British colonial period which included relatively less well developed institutions, social services, and facilities than were present for some other African countries at independence.

In 1963, independent Tanganyika joined with Zanzibar to form the United Republic of Tanzania. In nearly twenty years of independence, Tanzania has evolved its own unique political institutions and government. Perhaps the most distinctive aspect of Tanzanian government is the underlying philosophy of ujamaa socialism* formulated by Mwalimu Julius Nyerere, President of Tanzania since independence. Two innovations frequently noted in discussions of Tanzanian governmental

*Julius Nyerere's political philosophy is spelled out in his many writings, which include Freedom and Socialism (1968), Ujamaa: Essays on Socialism (1968), Decentralization (1972), as well as some more recent papers and speeches.

organization are ujamaa villages and the ten-house cell system. The philosophy of ujamaa, as articulated by President Nyerere, is based on a system of small-scale, cooperative communities where each individual works to the best of his or her abilities and joins in the decision-making process at the community level. Nyerere has worked diligently to explain to peasants living throughout the country his strong conviction that their best hope for increased governmental and social services as well as for self-reliance and independence is through communal efforts. During the 1970s a strong program of villagization undertaken by the central government resulted in the movement of many previously scattered subsistence farmers and/or herders into villages. In areas of the country where many people had previously lived in scattered hamlets, demographic patterns have been radically altered. The social consequences of villagization are not yet fully documented, but have included major changes in the lifestyles of the majority of Tanzania's peoples.

In line with the policies of ujamaa socialism and villagization is another major innovation in the governmental structure of independent Tanzania. This is the ten-house cell system (kumi-kumi) which was begun in 1965 and continues today. Every ten houses constitutes a cell which in turn has an elected leader. The leader's duties include serving as a broker between the members of the cell on the one hand, and the CCM (the national political party) and the government, on the other. Cell leaders are empowered to attempt resolutions of disputes arising in the local communities, to mobilize and organize work parties for cooperative activities, and to pass information upwards from their constituents and downward from government and party officials.

Thus, contemporary Tanzania's political structure is highly complex. It includes not only the central, regional, and district government and party offices and leaders, but also village and cell organizations which result in a highly structured and well-developed organizational network.

2. Social Aspects

Prior to the nineteenth century, the region which now makes up Tanzania consisted of a large number of small-scale ethnic groups and many more-or-less autonomous communities. There were few "chiefs" with

fixed or permanent authority. The boundaries between tribal and linguistic groups were often blurred and were subject to frequent changes. Significant contact with the outside world began for the societies of mainland Tanzania during the nineteenth century when Arab trading caravans made their way to the interior of the country in search of ivory, slaves, and other riches. In the latter part of the nineteenth century, the Germans began moving into inland Tanganyika, but their numbers and resulting impact was much less than that of the British who took over the administration of Tanganyika Territory following the first world war.

While there is no clear correspondence of linguistic to ethnic or tribal groupings, it is generally agreed that there are 120-130 "tribes" in Tanzania. Unlike many African countries, however, no single ethnic group dominates the political life of Tanzania. At least two reasons can be cited for this: (1) there is such a large number of ethnic groups, on the one hand, and (2) ethnic groups have not, on the other, been reinforced by the religious affiliations and the pattern of economic stratification introduced in Tanzania. The 1967 national census recognized over 120 ethnic groups. In addition to these, Arabs, Asians, and persons of European descent make up small portions of Tanzania's population. Although the number of non-Africans is small (less than one per cent of the population), they have played a prominent role in Tanzania. As the better educated and wealthier of Tanzania's peoples, they have influenced education, the economy, and the civil service. Beginning shortly after independence, the Tanzanian government took steps to progressively minimize, although not eliminate entirely, the foreigner's role in the nation. Religious identifications, be they Christian or Muslim, do not closely coincide with ethnic differences. In most parts of Tanzania, Christianity was accepted by Africans living near points of mission contact, Islam by those in coastal areas or along the trade routes where the Arabs who brought the Muslim faith had passed. Any given ethnic group is likely to have both its Christian and its Islamic subgroups. The overall population breakdown in 1967 was 26 per cent Christian, 25 per cent Muslim, with the remainder following traditional religions. In addition, economic differentiation has not followed exclusively ethnic lines. Dar es Salaam is geographically distinct from

the largest and "wealthiest" ethnic groups. Those who prospered most through sales of cash crops, the Chagga with coffee, and the Sukuma with cotton, for example, while numerically among the largest groups in the country, are neither large enough in absolute terms nor close enough to either Dar es Salaam or the planned capital at Dodoma to be viewed as serious threats by other groups.

By African standards, Tanzania's linguistic problems are small ones. Although its African population of over 17 million people speaks more than 100 languages, Swahili is widely known throughout the country. Tanzania is the largest African country to adopt an African language as a national and official language.

3. Economic Aspects

During the colonial administration, most of the Tanzanian population lived in rural areas, in scattered settlement patterns consisting of small collections of related families (rather than villages), with the size dictated by the resource base and the nature of subsistence economy. Rural development was centered upon the large estate and plantation agriculture, with no assistance being provided to the great bulk of the population, the subsistence farm families. The economy was essentially extractive, with agricultural products in excess of local needs being exported in the raw state, while finished goods made up most of the imports, since little industrialization was allowed.

Following independence, and especially since the Arusha Declaration, socialism and self-reliance have been emphasized by decentralization of governmental administration and through the formation of cooperative groups and ujamaa villages. The villages were ultimately to become the key producing unit in the rural area based upon the belief that a communal cooperative effort would produce greater production and greater returns than individual efforts. As part of this program, the government is emphasizing greater utilization of local resources with less dependence upon imported goods and foreign exchange.

In agriculture, the government is stressing self-sufficiency in food crops for the nation as a whole, with growers encouraged to produce a surplus above their needs in order that reserves may be established to carry the population during periods of drought, or other low

yield years. As one means of achieving this purpose, a national grain storage reserve has been established.

During the past ten years or so Tanzania's traditional relationships with world markets have been undergoing some changes. Sisal is no longer as important, and oilseed production has not been sufficient to meet local demands and to provide a surplus of the scale of former years. The result has been a diversion of former export sales to local processing, with the loss of valuable foreign exchange. This has come at a particularly critical time, since the necessary imports of petroleum products are absorbing about 45 per cent of the country's foreign exchange as a result of the rapid acceleration of petroleum prices by producers.

D. Summary of Prior Studies

Although several relatively recent studies had applicability to the conduct of the rural access road study, there have been no prior studies of this element of the transport system in the three study regions. On a national basis the only recent (1975) study which specifically addressed the issue of feeder roads was the Tabora region study sponsored by the Swedish International Development Authority.[1/]

There have been three studies conducted which addressed in general, and as part of a larger scope, the issues and problems associated with the condition of the rural access roads in the study regions. A brief description of the four studies follows:

--Dodoma Regional Integrated Development Plan[2/]--This report, in five volumes, structures multi-sector development requirements, implementation program, and resource requirements for the entire Dodoma region through 1983. It contains a special annex which summarizes in brief the existing situation with regard to secondary roads in the region. The annex also sets forth an abbreviated proposed program for repair, rehabilitation and maintenance of parts of the secondary road system in the region. The foreign currency portion of the program was estimated at about U.S. $2.9 million.

1/ Brokonsult AB, A Feasibility Study of the Development Potential and Feeder Road Improvements in the Tabora Region, 1975.
2/ Office of the Regional Development Director, Dodoma Regional Interim Development Plan, 1980.

--Dodoma Transport and Logistics Study[1/]--This two-volume report was prepared for the Capital Development Authority in late 1977. The study covers freight and passenger ground transport on the road and railway system for the entire region. Investigations focused on identifying urgent improvement requirements, and future transport service improvements through 1986. As a result of analysis, the team submitted a series of findings and recommendations with respect to road, railway, interregional truck fleet, and interregional bus service improvements and potentials for coordination. This study included an inventory and analysis of rail, truck, and bus services in the Dodoma region. Attention was called to the poor condition of the rural access roads (a situation which has not improved), but the study contained no real analysis of this segment of the transportation network.

--The Tanzania Highway Economic and Engineering Study[2/]--This three-volume report was prepared for the Ministry of Communications, Transportation and Labor in 1972 by Lyon Associates, Inc. This study provided: (1) an inventory of existing equipment, facilities, management structure, and accounting systems; (2) an analysis of the demands for transportation, the costs and benefits of road transport, and financing prospects; and (3) a detailed mapping and technical presentation of the Trunk Roads, bridges, and soils in Tanzania.

1/ Brokunsult, AB, Dodoma Transport and Logistics Study, 1978.
2/ Lyon Associates, Inc., Economic and Engineering Study, Tanzania Highway Maintenance and Organization, 1972.

III. TECHNICAL BACKGROUND

A. Road Network Description

1. General

Most of the original roads in Tanzania were built up from old caravan trails established by traders pushing inland from the coast. Others followed the rough trails of the game animals. Subsequent roads were established to develop the interior and expand communications and trade.

The policy in recent road development has been based on providing a balanced roadway system of all-weather Trunk Roads. There are four major east-west Trunk Roads and three north-south Trunk Roads that connect the regional capitals of the country and provide connections with the neighboring countries. These are shown in Plate III - 1.

The present network of roads exclusive of feeder roads consists of approximately 45,000 kilometers. This compares with 34,125 kilometers of roads as carried on the Comworks inventory in 1970. The general breakdown of this system is given in Table III - 1.

Approximately 7% of this road network is paved as compared to about 6.5% in 1970. However an additional 10,875 kilometers have entered the network including almost 1,000 kilometers of paved Trunk Roads and 180 kilometers of paved Local Main Roads. The overall increase of 2,440 kilometers of Trunk Roads includes reclassification of some 2,000 kilometers of Local Main Roads which explains the reduction in that category. The most impressive increase is in the Tertiary Road system, where over 10,000 kilometers have been added to the network.

2. Classification

The existing Ministry of Works classification for the total road network is as follows:

a. Trunk Roads comprise the main internal through routes. These are interregional routes and some connect to international routes.

b. Local Main Roads - comprise all other main roads. These are both interregional and intraregional and connect centers of economic and administrative activity with the Trunk Road system.

c. Regional Roads and

d. District Roads comprise all other classified roads. Regional Roads are interdistrict and also interregional while District Roads are intradistrict.

e. Unclassified Roads comprise the remainder of the network. A draft revision of the Ministry of Works classification now lists these as major feeder roads and minor feeder roads, with different design standards proposed. Essentially these are not through roads, linking single villages or centers to the remaining road system.

3. Traffic

At the present time the Ministry of Communications and Transport is responsible for undertaking traffic counts. Unfortunately the traffic count system that existed in the past has deteriorated. Information is available for the entire Trunk Road system up to 1974. Since that time counts have only been made on a sporadic basis. There is no traffic data on the remaining network.

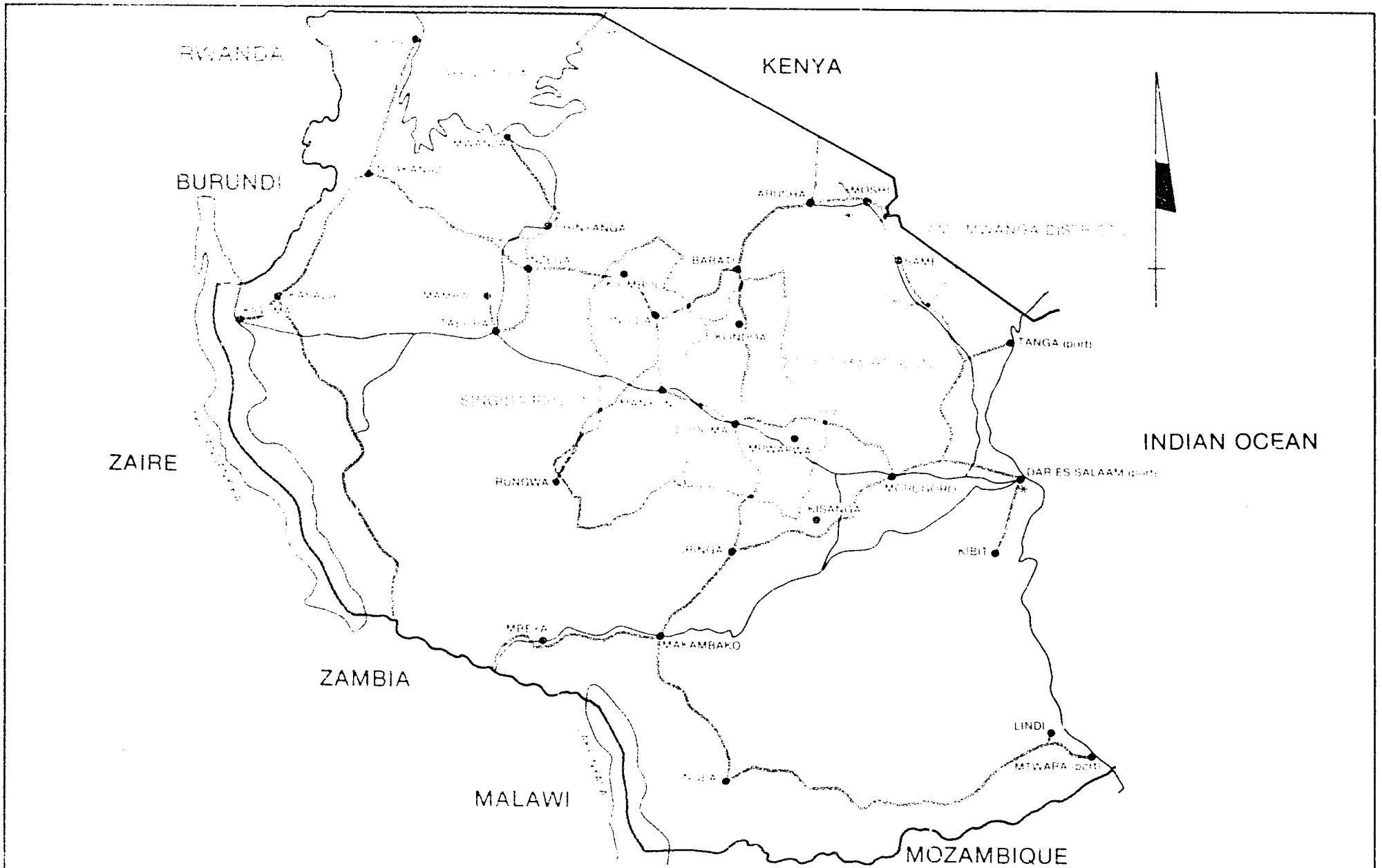
Traffic growth data is incomplete but it has been estimated at 2 to 5% annually for the past 5 years. The slow growth rate reflects many factors such as increased fuel cost and vehicle import restrictions both of which have caused increases in truck (and axle) loads; and a reflection of reduced agricultural production during recent years of drought.

The bitumen surfaced Trunk Roads and Local Main Roads carry relatively high traffic volumes. Most recently available traffic figures indicate these roads average 350 vehicles per day (VPD) but range as high as 1400 VPD.

The remainder of the Trunk Road system of gravel and earth roads are generally in poor to very poor condition and carry an average of 55 VPD. A few of these, less than 5%, carry over 150 VPD and many carry less than 50 VPD. In terms of traffic volume, approximately 95% of these earth and gravel roads would be considered low volume roads.

The Trunk Roads in Dodoma and Singida Regions fall in this category. The bitumen Trunk Road in Mwanga and Same Districts, B-1, is the only road in the project districts above the low-volume category.

The traffic on the remaining roads is also light. It is doubtful if any carry more than 50 VPD and most carry considerably less. Many Tertiary and Feeder Roads carry under 10 VPD.



Tanzania Rural Roads
Feasibility Study

LYON associates, inc.

Tanzania
Study Areas
Location Map
Plate III-1

Legend

- Railroad
- Region
- International Airport
- Truck Road

TABLE III - 1

Total Length and Road Types

	Primary Trunk Roads	Secondary Local Main Roads	Tertiary Regional & District Roads	Totals
1970 Bitumen	1,690	544	-	
1978 Bitumen	2,660	364	-	
1970 Earth	5,186	9,461	17,244	
1978 Earth	6,656	7,330	27,990	
1970 Total	6,876	10,005	17,244	34,125
1978 Total	9,316	7,694	27,990	45,000

Sources: Ministry of Works, 1978
Lyon Associates, 1972

B. Motor Transport

1. Introduction

The review of the motor transport industry was devoted to an overview examination of the trucking industry and bus operations in the study regions. Particular emphasis was placed on the extent of existing services on the feeder roads and industry problems related to the condition of the roads.

Although the available data base is extremely marginal, the direct relationship between the poor condition of the feeder roads and the inadequacy of village truck and bus services was cited throughout the field interviews. This observation has also been cited in reports and papers on the transportation problems in Tanzania, specifically the Dodoma Transport and Logistics Study,[1/] and the recent East African Management Institute report on internal trade.[2/]

The following subsections present overview findings with respect to the trucking industry, and the public transportation systems in the study regions.

2. Trucking Industry

As of 1975, there were about 13,000 vehicles in the nation's private and parastatal truck fleet. About 10,000 vehicles were privately owned and 3,000 publicly owned. Surveys of the entire vehicle fleet with respect to fleet size, composition and industry operations are being undertaken by the Ministry of Finance and Planning, and a systematic data collection system for the transport industry is included in the World Bank Trucking Industry Rehabilitation and Improvement Project.

The fleet of 13,000 vehicles accounts for much of the country's total freight transport services. The public services organized under special industry transport companies have been deteriorating over recent years as a result of inefficiencies, low productivity, and unreliable services. The privately-owned trucking operations have been hampered by the condition of the roads, the lack of working capital, high interest rates, government regulation of the importation of vehicles and spare

1/ Brokunsult AB, Dodoma Transport and Logistics Study, 1978.
2/ Board of Internal Trade, Transport as a Factor Affecting the Efficiency of the Internal Trade System in Tanzania, East African Management Institute, 1978.

parts, and a general loss of confidence during the transfer of the trucking industry from private to public ownership.

Although it is generally accepted that the present trucking system is inefficient, there is no reliable information at this time as to whether the capacity of the existing fleet is adequate to meet the current and future transport requirements.

More than half the trucks in the country in 1971 had capacities of 6 tons or less, and only 5 per cent had load capacities of over 10 tons. Recent trends are toward the importation of larger capacity trucks to effect the economic benefits of lower costs per ton-kilometer.

The private sector operators are relatively efficient in that they concentrate on long-haul business, avoid short hauls and areas where the roads are in poor condition. This policy unfortunately penalizes the rural areas which have poor quality feeder roads. Although they tend to concentrate on the lucrative hauls, the private sector suffers from excessive breakdowns and inadequate spare parts. The private sector's high utilization rate (about 60 per cent compared to parastatal utilization of 40 per cent) is attributable to the fact that there are high financial incentives associated with reducing loading and unloading times, traveling at higher speeds, carrying full loads, and finding backhaul loads.

The public sector trucking operations account for one-third of the total industry services. These services are provided by transport parastatals, trading companies and crop authorities. The government, in cooperation with the World Bank's on-going Trucking Project, is reorganizing and establishing regional trucking companies in Mwanza, Tabora, Mtwara and Dodoma, and a mobile reserve fleet in Dar es Salaam.

Truck availability (ratio of operating vehicles to fleet) in the public sector is comparatively low due to inadequate maintenance and repair workshops, spare parts, maintenance personnel, management, and roads. Public truck utilization is constrained by poor management, driver motivation, difficulty in obtaining spare parts, and the poor condition of the road system.

There are no nationally established freight rates in effect at this time in the trucking industry. The private sector truck rates for four commodity groups (crops, timber, fuel and metal/steel) are

on a differential basis (T/shs per ton-mile) in terms of the one-way trip, and are revised frequently and generally provide profit. The current rates per ton-km. are T/shs 1.50 for crops, T/shs 1.80 for timber, T/shs 1.35 for fuel, and T/shs 2.00 for metal/steel.

The charge to the shipper is twice the rate to account for the backhaul, e.g., a rate of T/shs 1.50 per km. for 100 kilometers amounts to T/shs 300 (1.50 x 2 x 100 km.). The private sector trucks are employed to augment the public sector trucks when the supply of parastatal equipment is insufficient to meet the demands. This is particularly evident during crop harvest seasons. Private truckers are requested to bid on contract services to the regional trucking companies and crop marketing authorities during requirement periods. Although target contractors' rates are established by the parastatals and authorities through the Regional Development Director, the cost of providing the service from the private sector usually influences the negotiated rate. The current variability and inefficiency of the rail service has enabled the truckers to capitalize on the situation and charge significantly higher rates than rail rates, and continue to attract bulk cargo away from the rail system.

During harvest seasons the government will pay a premium rate to insure the diversion of private truckers to the movement of high priority items. The public authority transport rates, for internally controlled trucks, do not reflect the actual cost of providing the service.

Although there are no reliable statistics with respect to the size of truck operations in the study regions, some general, but not necessarily consistent, information is available. Estimates of the size of the truck fleet in the Dodoma region range from 104 vehicles to 286 vehicles. The Dodoma Transport and Logistics Study[1/] indicates there were 160 licensed vehicles operating in the Dodoma region in 1977, with 104 under 3.5 tons, 51 with payloads between 3.5 and 7.5 tons, and 6 over 7.5 tons. Of the 127 licensees, 69 are based in Dodoma. Four truck operators have a registered fleet of more than two vehicles--FAVDO (the parastatal regional transport company) had

1/ Brokonsult, AB, Dodoma Transport and Logistics Study, 1978.

eight 7-ton trucks and 10 10-ton trucks in 1979. The Regional Trucking Company had 4 7-ton trucks and NMC had 3 7-ton trucks and 6 10-ton trucks. In the harvest months the government contracts with private truckers at higher prices than those established for the parastatals. This increase is between T/shs 0.20 and 0.30 per ton-km. Return load opportunities in the Dodoma region are rare due to the lack of major industry and the seasonal nature of the agricultural output movement.

There is general concurrence that there are about 118 trucks in the Singida region. The Regional Trucking Company operates a fleet of 8 vehicles with a total capacity of 62 tons. The remaining 110 vehicles have a total capacity of 558 tons. As in the Dodoma region, the trucks are fully loaded on the outbound haul but under-utilized on the backhaul. The return loads of the Regional Trading Company are collected from the National Milling Company and crop authorities.

There is a wide range (300-1000) of truck fleet size estimates for the Kilimanjaro region. The Regional Truck Company operates about 9 trucks in the 5- to 9-ton range. The distribution, use, and capacity of the fleet is not known at this time.

Although much research is required with respect to the existing fleet and opportunities to rehabilitate the industry, it is clear that current services on the rural roads to the villages are unreliable and uncoordinated.

3. Bus Transport Industry

Public transportation is provided by a combination of Regional Transport Companies and private bus operators. The concept of Regional Transport Companies started in the regions of Lindi, Mtwara and Ruvuma, and the Coast and Dar Es Salaam regions. With the dissolution of Regional Cooperative Unions in 1976, a number of new Regional Transport Companies were formed in the Dodoma and Tanga regions and others are being planned at present. These transport companies operate both buses and trucks.

As of 1972, about 3,800 buses were operating in the country.[1/]

1/ Central Registry of Motor Vehicles.

The actual operating fleet at present is influenced by the number of new vehicles entering the fleet and the rate of deterioration of the existing fleet.

Bus service is provided in the three study regions by a combination of parastatal companies, private bus operators, and village cooperatives. Of the 65 intercity buses operated by the TRC, the Dodoma-Kondoa-Arusha (Dodoma-Arusha Road Service) line competes with regional transport company services. This service continues from Arusha to Moshi and through Same and complements the regional services provided in the Kilimanjaro region by six bus companies.

Bus service in the Dodoma region provided by about 40 buses operates out of the district capitals of Dodoma, Kondoa and Mpwapwa. Most of those services, provided by KAVDO and private companies, provide regional bus service on a daily or six days a week basis. The route structures usually start at district centers, traverse district roads, and terminate at the main roads.

KAVDO operates services from Kondoa to Kisaki, Kondoa to Kwadelo, Kondoa to Sanzawa and Kondoa to Ovada in the Kondoa district. They also operate service from Mpwapwa to Mlali and Mpwapwa to Kongwa in the Mpwapwa district. The rates established at the national level are T/shs 0.18 per passenger-mile on surfaced roads and T/shs 0.20 on non-surfaced roads. The Dodoma district service provided by KAVDO is for the most part on the main roads.

The parastatal services are supplemented by services provided by regional cooperatives. There is one bus operating daily on the Igandu-Mghaheze-Handali-Mdebwe-Mvumi Mission-Mvumi-Makulu-Makangwa-Main Highway system. The one-way fare for the entire system is T/shs 14.00.

Large portions of each of the districts in the Dodoma region do not have bus service. The operators avoid roads in poor condition and focus service on those routes which are in the best condition. In the areas where service is provided, the passenger is confronted with totally full buses after the first stop. The condition of the buses, the out-of-service rate, and the capacity loads all contribute to the poor quality of service in these four areas where service is provided.

Services in the Singida region are provided by the Kinanda Bus Company, the Kampuni Transport Company, the Iramba Cooperative Bus

Company, and two private bus lines serving Nduguti.

The Kinanda Bus Company provides: (1) daily service from Singida to Manyoni, (2) twice a week service from Singida to Ihanja, (3) daily service from Singida to Makiungi, (4) twice a week service from Singida to Ntunto, and (5) twice a week service from Singida to Misughaa. The company also provides trunk road service from Singida to Itigi, Dodoma and Mbulu. The fleet is composed of 55 to 65 passenger vehicles.

The Iramba Cooperative operates a service from Singida to Nduguti, and on to Ibaga on a 3-trip-a-week basis. They also operate six trips a week from Singida to Kiomboi, daily service from Singida to Mwanza, and 3-day-a-week service to Dodoma. The company operates 5 buses at total capacity. There are two private bus companies, the "New Arusha" and the "Yellow Line," that also provide service to Nduguti. The New Arusha has 3-day-a-week service from Arusha to Singida to Ibaga. The Yellow Line provides service between Ibaga and Singida on a four round-trips-a-week basis.

There are at least six bus companies operating buses between Moshi and Dar es Salaam. These companies provide about 10 trips a day on the tarmac road through the Mwanga and Same districts. This direct routing, however, does not provide service to Gonja, Ndungu or Kihurio in the Same district. Service in this area is provided currently by the Mamba Vunta Transport Cooperative which also provides five daily routes between Moshi and Tanga. This company is planning on initiating new service from Moshi to Same (with diversion at Same to Kisiwani, Maore, Ndungu, Kihurio and Mkomazi), then to Mombo, Korogwe and Tanga or Dar es Salaam. This new service will provide mobility to a large share of the population which is currently bypassed by the Moshi-Dar es Salaam service.

There is a small private bus operation which provides daily local service from Mwanga to Ugweno, and Mwanga to Usangi. This service provides connections to the trunk line interregional services, population accessibility to Mwanga, and limited freight/package bus service within the area.

C. Railway Transport

There are two railway systems operating in Tanzania: the Tanzanian Railway Corporation (TRC) and the Tanzania-Zambia Railway Authority (TAZARA). TAZARA, which is jointly owned by Tanzania and Zambia, operates 970 kilometers of track from Dar es Salaam to the Zambian border and another 890 kilometers into Zambia. The service and growth of this line has no direct impact on the regions within this study since it is principally used for exports of Zambian copper and Zambian imports.

The TRC was established in 1977 as a parastatal to operate the East African Railway Corporation (EARC) lines within Tanzania. Much work has been accomplished in the last year by the Canadian Government (CIDA) to assist the TRC in establishing effective rail service. During 1979 the Canadian Sector Team conducted a complete inventory of track, rolling stock and yards, analyzed the current freight movements, established railway system goals for the year 2000, developed an investment plan for the next 20 years, and developed the first financial statement since 1974. The results of a 13-man-year study of TRC are due to be released in the next six months. The Canadian Government is continuing to assist in the improvement of the TRC by building a U.S. $13.5 million maintenance shop in Morogoro as part of its U.S. $75 million program over the next three years.

TRC manages and operates about 2,600 kilometers of one-meter gauge track in northern Tanzania, approximately 133 locomotive units, and a fleet of about 5,000 units of rolling stock. The rail system links Dar es Salaam and Tanga with Arusha, Tabora, Mwanza, Kigoma, and Dodoma.

At present the rail system is operating at about 30 per cent of its capacity. It was reported by the Canadian team that the track is in sufficient condition (with the exception of about 180 miles of 60-lb. rail which should be replaced with 80-lb. rail) to handle 1.5 million tons of traffic per year. In addition, the locomotives and rolling stock are in relatively good shape to handle 1.6 million tons of traffic. Current 1979 traffic volumes were only 0.9 million tons, or about 30 per cent of the existing rail demands by shippers.

The major problems with the current system appear to be associated with management and supervision. The magnitude of the existing operational and supervisory problems can be appreciated when one notes that there were 400 derailments (out of a total of 478) in the yards in 1979.[1/]

1/ Reported by Canadian International Development Agency, Rail Sector Team leader.

The training of operational and management personnel at all levels is required to bring the rail system up to the current rated capacity, and to meet the service goals and potentials over the next 20 years. The objective for the year 2000, in terms of freight traffic handled, is 3.2 million tons, according to the Canadian sector team study. This level of target service will require an investment of U.S. $500 million.

Of the 900,000 tons of rail traffic in Tanzania in 1979, approximately 93 per cent was moved within the country while the remainder crossed the country to Zaire and Burundi.

Detailed rail traffic statistics are not available at this time through TRC. The recently completed Canadian study will include rail shipment statistics in terms of origin and destination, and an analysis of truck competition. As a general observation, about 20 per cent of the total system traffic moved in the Dodoma region. In 1979 about 41,300 head of cattle were shipped from the Dodoma and Gulwe stations in the Dodoma region, and the Manyoni station in the Singida region. For the same year, about 19,000 tons of coffee moved out of the Moshi station which serves as a regional distribution center for the coffee production of the Same and Mwanga districts (as well as other districts) of the Kilimanjaro region. There is currently one freight train a day scheduled to and from Moshi and Dar es Salaam, and six freight trains to and from Dodoma from Dar es Salaam.

Shippers contacted by the consultant during the field survey reported that the quality of rail service in the study regions was generally poor. Examples were given of waiting up to 30 days for cars in which to ship cattle. Substantial weight losses and an unreasonable number of deaths were also reported because of delays in transit while moving cattle by rail to Dar es Salaam.

Although a detailed analysis of rail rates was beyond the scope of this study, several summary observations are in order which may bear on the future agricultural distribution system of Tanzania. At present the rail rates are not sensitive to the volume or value of the commodity hauled. The newly established rates (first increases since 1974) are for livestock, containers, milk and cream, motor vehicles, and general goods on a unit basis (head, weight, or number) per kilometer. These new rates, effective on April 1, 1980, increased the previous rates by 20 per cent. New rates for the transport

of petrol, oil and lubricants, effective on December 1, 1979, raised the rate from T/shs 1.1 to T/shs 1.35 per 100 kilos per kilometer.

If the rail service becomes more reliable and efficient, some shippers will be attracted away from the comparatively costly truck service to rail transport. The future financial viability of the rail system rests on raising the traffic to the system capacity and re-orienting the rate structure to consider the value and volume of the commodity shipped. As a basis of comparison, the rate charged by the truck operators is between three and four times that charged by rail for the same distance and commodity.

A ton of coffee from Moshi to Dar es Salaam is moved for T/shs 700 by truck, compared with T/shs 120 by rail. A 200-km. shipment from Morogoro costs T/shs 166 per ton by truck compared by T/shs 58 per ton by rail. In such comparisons, however, one must consider the total transport cost of each mode, not just the rate. This would include in many cases hauling to and from the railroad, delays in transit, loss and damage and other aspects of service which are reflected in additional costs to the shipper.

The truckers have been able to capitalize on the poor quality and reliability of rail service, in which these latter factors translate into high costs to shippers, so much so that they prefer trucks in spite of the rate differential.

The TRC also operates rail passenger trains throughout its system. In 1976 they carried about 5 million passengers on the system. A total of 128,655 passengers were booked from Dodoma to various destinations in 1979, and about 36,000 passengers traveled from Dar es Salaam to Dodoma. There are three scheduled passenger trains a week from and to Moshi and Dar es Salaam, and daily service between Dar es Salaam and Dodoma. The system average passenger rate per kilometer is approximately T/shs 0.35 for first class, T/shs 0.16 for second class, and T/shs 0.08 for third class. These rates may be compared to the intercity bus rates of about T/shs 0.17 per passenger-kilometer for the 65 intercity buses operated by the TRC on non-parallel routes.

D. Air Transport

Two of the twenty-three officially designated commercial airports in Tanzania exert influence on the study regions. There is the commercial airport in Dodoma and the international airport located in Kilimanjaro. Both of these airports serve scheduled and non-scheduled flights. The scheduled flights operate according to published timetables and rates. The non-scheduled flights operate on an irregular basis.

The national air transport company, Air Tanzania (established in 1977), provides the majority of the domestic service, although there are some charter services in the study regions. Air Tanzania operates its fleet, which is composed primarily of Fokker F-27s, within the boundaries of the country and limited services to certain neighboring countries. The service between Tanzania and Kenya, suspended in 1977, has not been reestablished despite persistent rumors of impending reinstatement of service.

The majority of the nation's commercial air service and air transport utilization occurs at the Dar es Salaam and Zanzibar airports. Over 48 percent of the total air passengers in 1977 were emplaned or deplaned in Dar es Salaam. Twenty-nine percent of all operations and 72 percent of the air freight took place at Dar es Salaam airport. Zanzibar accounted for 27 percent of the passengers, 20 percent of the operations, and 10 percent of the air freight movements. It should be noted that the total iar freight for 1977 (inbound and outbound) was only 3.8 million kg. (3,630 tons). The high cost of air freight in Tanzania precludes the transport of all but the highest value-per-pound commodities such as machinery parts, medicines, and health services equipment and supplies.

The total 1977 operations at the Dodoma airport represent 3.5 percent of the national total of 20,681 operations while the Kilimanjaro airport accounted for 9.6 percent. In terms of passengers, Dodoma emplaned and deplaned less than 1 percent of the national total of 465,490, and Kilimanjaro represented 5 percent. The freight at Dodoma was 1.6 percent of the total, while Kilimanjaro handled 4.7 percent.

There were only 2,579 general aviation passengers at the Dodoma airport in 1977, and 2,191 general aviation passengers at Kilimanjaro. There were 446 passengers at the Arusha airport in 1977 and 129 passengers at the Moshi airport. The services at these two airports have decreased significantly over the last 10 years. In 1968 there were over 16,000 passengers at Arusha, and 23,190 at the Moshi airport. It would appear that the Kilimanjaro International Airport is now receiving the majority of the rescheduled flights, passengers and freight.

E. Ports and Shipping

There are three principal ocean ports in Tanzania. The ports of Dar es Salaam, Tanga and Mtwara were organized under the Tanzania Harbors Authority (created in 1977) to take over the operation of the East African Harbors Corporation. Each of the three ports handles both seaborne cargo and coastal shipping. The seaborne cargo represents about 95 per cent of the traffic, while coastal traffic to various coastal and inland ports accounts for the remaining 5 per cent of the 3 million tons of cargo for 1977. It is interesting to note that the cargo handled on a national basis and at the three ports has decreased from a high in 1975 (Tanzania total 4.4 million tons) to the levels experienced around 1971.[1/]

Of the total of 3.03 million tons in 1977, the port of Dar es Salaam handled 2.54 million tons, or 84 per cent of the total. Coastal cargo at the port was 65,551 tons and seaborne cargo was 2,478,641 tons. The port served 1,943 ships in 1977, and 46,475 passengers (embarked and disembarked) at the 11 berths for ocean-going ships.

Approximately half of the 2.54 million tons of cargo loaded and unloaded at the Dar es Salaam port originates or terminates in Zambia.

Coastal shipping of freight and passengers is controlled by the Tanzania Coastal Shipping Line, Ltd. This parastatal corporation provides services between various coastal and inland ports south of Dar es Salaam. This mode of transport is highly seasonal. During the rainy seasons when road transport is unreliable, the coastal traffic increases.

Other water transport services are provided on Lake Victoria and Lake Tanganyika.

The Tanga port, which has no deep-water berths, handled 10 per cent (324,616 tons) of the total ocean port cargo. Approximately 30,000 tons of the total Tanga port cargo is coastal traffic. Tanga port facilities handled 3,900 passengers, or 7 per cent of the total of the three ports, in 1977. Over 90 per cent of these were coastal passengers.

The Mtwara port, with two deep-water berths, handled 6 per cent of the cargo processed at the three ocean ports. Of this 165,057 tons, 112,214 tons were seaborne cargo and 52,843 tons were coastal freight. This port also processed 11,190 coastal passengers, or 18 per cent of the total passenger traffic at the three major ports.

1/ Bulletin for Transport Statistics, 1968-1976, Shipping Statistics, Bureau of Statistics, Table 35, 1976.

The Dar es Salaam port and to a limited extent Tanga port handle the cash crop exports produced in various parts of the three study regions (as well as from other regions). They consist primarily of cotton, coffee, sisal, tobacco, and the oilseeds (castor and sunflower). Meat and meal preparations processed in Dar es Salaam are additional export items which originate from cattle out of Dodoma and Singida regions in particular. These three ports are also used for the movement of non-agricultural products such as machinery and manufactured items.

F. Relationship of the Rural Access Road Program to National Transportation Network

The rehabilitation and maintenance of the rural access roads has the potential to input significantly upon the ground transport services and opportunities in the study regions. Primary benefits can be expected in the area of highway and road physical distribution within each region and between the regions and the rest of the country. The improvement of the rural roads will open major agricultural areas to the trunk roads and reduce the current barriers in the continuity of the existing network of roads.

Reductions of these transport barriers in the rural road systems will also make more effective the current and planned investments in the trunk road system. Generation of freight and passenger transport services in the rural areas will result in higher utilization of the rest of the highway networks in each region.

The transport of rural village products from the villages to main line transport depots will also have an impact on the railroad system. To the extent that the system is improved up to existing and planned capacity the interregional shipment of goods will increase.

Improved rural roads will serve to increase the demand for efficient interregional transport. The transfer of freight from truck to rail (or rail to truck), will increase if the efficiencies and costs of both modes are coordinated to improve the total physical distribution opportunities.

The second collorary impact of improved rural roads is expected to be felt in the opportunities for expanded public transport services. Current reluctance to expand existing bus services and form transport cooperatives will be reduced as a result of improving existing and potential road routes in the rural areas. Expanded opportunities for mobility will serve to reduce travel time to needed social and economic centers such as those for medical services, government services, employment centers, and community/family visits.

The improvement of rural roads will also impact upon the utilization of the nation's port facilities by creating greater opportunities for export product movements, and demand for imports.

There is little or no expected impact of rural access road improvements

upon the air transport system with the possible exception of high valued machine parts or other similar products. As villages develop local industries as a result of many factors, including access, needs for rapid transport of machinery parts, and small industrial equipment may emerge.

IV. SOCIAL ANALYSIS

It became clear early in the design of the social and economic analysis element of the feasibility study that the acquisition of primary/secondary source data required both field surveys at the region, district, and administrative division levels of government, and interviews at the appropriate Tanzanian ministries. This section provides the results of the social service and demographic data collected throughout the "on-site" data acquisition survey and other secondary source data available through sources such as the World Bank, the Agency for International Development, and the United Nations.

Although a conscientious effort was devoted to develop and assemble a data base on a consistent basis it became clear that discontinuities in the development and publication of national, regional and district social statistics and data is a major problem in Tanzania. The Bureau of Statistics and Ministries in Tanzania are at various states of conducting surveys of 1) manufacturing and industry activities, 2) existing health facilities, and 3) existing and planned educational services. At the same time the Bureau of Statistics is in the process (over the next two years) of reducing and publishing the results of the 1978 Population Census. Unfortunately the national, regional and administrative division data development and analysis activities are at varied stages of availability. Available data in some areas, such as employment and wage statistics, has not been published in a number of years. The ministry level statistical analysis and timely publication problems are exacerbated by 1) an apparent lack of coordination at the national level in data acquisition, analysis and publication, 2) discontinuities in statistical and data base analysis capability, and 3) the effects of decentralizing administrative responsibilities to lower levels of government. On a more positive note the results of the 1978 Population Census should provide an excellent framework for various ministries to update and calibrate their statistical base and assist in their program development.

This section provides separate presentations of population, health and education facilities, services, objectives, transport related problems, rural water supply and other social aspects of the study regions.

A. Population

1. Introduction

Demographic characteristics are fundamental to understanding the relationship between economic and social activity and transportation requirements. The recognition of demographic trends and characteristics form a basis for discriminating among various opportunities for road improvement, and for projecting the potential impacts of investments in the road system on the local and national economy. Consistent with this recognition a major part of the Tanzanian field work was devoted to developing a comprehensive demographic data base for the study regions. It will be noted in discussion of the prioritization of road improvements by administrative division and district, that this demographic data served as a major element in the methodology.

The data presented in this section of the report were developed through extensive work with the National Census Bureau in Dar es Salaam. Although the results of the 1978 Population Census are not available in published form, the Census Bureau provided invaluable assistance in extracting and organizing enumeration data at their various stages of reduction in preparation for publication. The Summary Volume of the 1978 Census, to be published in the near future, will be followed by a series of 8 detailed-analysis volumes over the next several years. This ambitious undertaking should fill the many conspicuous gaps in information and knowledge about the status, requirements, and directions of the Tanzanian economy and investment requirement.

The objective of this section is to present the results of the field survey of population data with respect to 1) demographic characteristics, 2) size and distribution, 3) labor force and employment and 4) projections.

2. Ethnic Composition

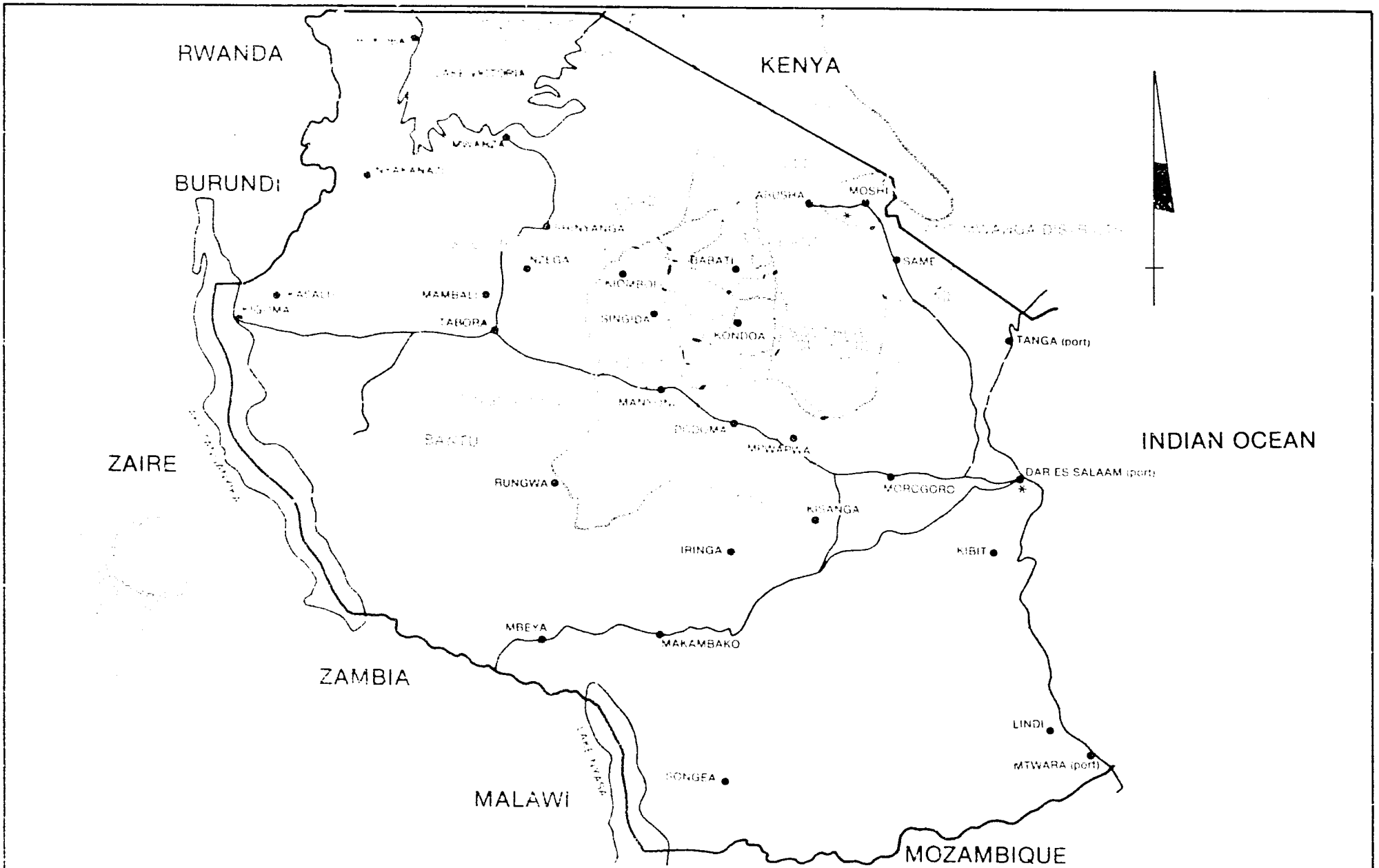
The tribal groups comprising the native African population of Tanzania number around 130. Exact determination of the number of tribal groups is difficult since there is little agreement upon what constitutes a tribe or ethnic group itself. For the purposes of the 1967 census, a tribe was defined as "a group of persons who share the same cultural system, including language, who claim a

common origin, and live on the same territory, very often with a common politial system.[1/] Following this usage, census enumerators found around 130 indigenous tribes within mainland Tanzania in 1967. In addition, there were ethnic minorities consisting of non-African groups (Arabs, Asians, and Europeans) as well as some Africans living within Tanzania whose tribal homelands are located beyond the borders of the nation of Tanzania.

Roughly 95 per cent of Tanzania's African population are Bantu in language and culture, with the resulting consequence that the vast majority of peoples share many linguistic and cultural characteristics. This fact of great cultural and linguistic similarity is shown on Plate IV - 1 which reveals basic similarity of most of Tanzania's population. The exception to this (roughly 5 per cent) are located in north-central Tanzania. In the areas of concern for this project, only Kondoa district of Dodoma region contains non-Bantu peoples. Otherwise, all peoples in the three regions of concern are Bantu.

The Same and Mwanga districts of Kilimanjaro region (formerly Pare district) are ethnically homogeneous in that most of their population consists of the Bantu-speaking Pare people. Plate IV - 2 ("Ethnic Groups in Dodoma and Singida Regions") shows the ethnic groups which live within these two regions. At least 12 tribal groups have been delineated within these two regions. It should be noted, however, that some of these groups are quite similar to their neighbors and might be considered by some anthropologists or sociologists as members of sub-tribes rather than separate ethnic groups. Nonetheless, Dodoma and Singida are regions of cultural complexity, and only in a few instances do ethnic boundaries coincide with administrative divisions. Further, it should be noted that the boundaries of traditional tribal homelands were frequently fluid prior to European control of the area. Thus, the approximate areas shown on Plate IV - 2 should be considered to be areas of greatest concentration of the tribal group indicated as inhabiting the area. These boundaries are based on the work of Philip Gulliver, staff anthropologist for the British Colonial Government of Tanganyika. Table IV-1 lists the districts of concern for

1/ Lucas and Philipson, "Ethnic Characteristics," Ch. 10 of The Population of Tanzania, An Analysis of the 1967 Population Census, edited by Egero and Henin, Dar es Salaam: BRALUP and Bureau of Statistics, p. 157.



Tanzania Rural Roads Feasibility Study

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Tanzania
Study Areas
Major Languages
Plate IV-1

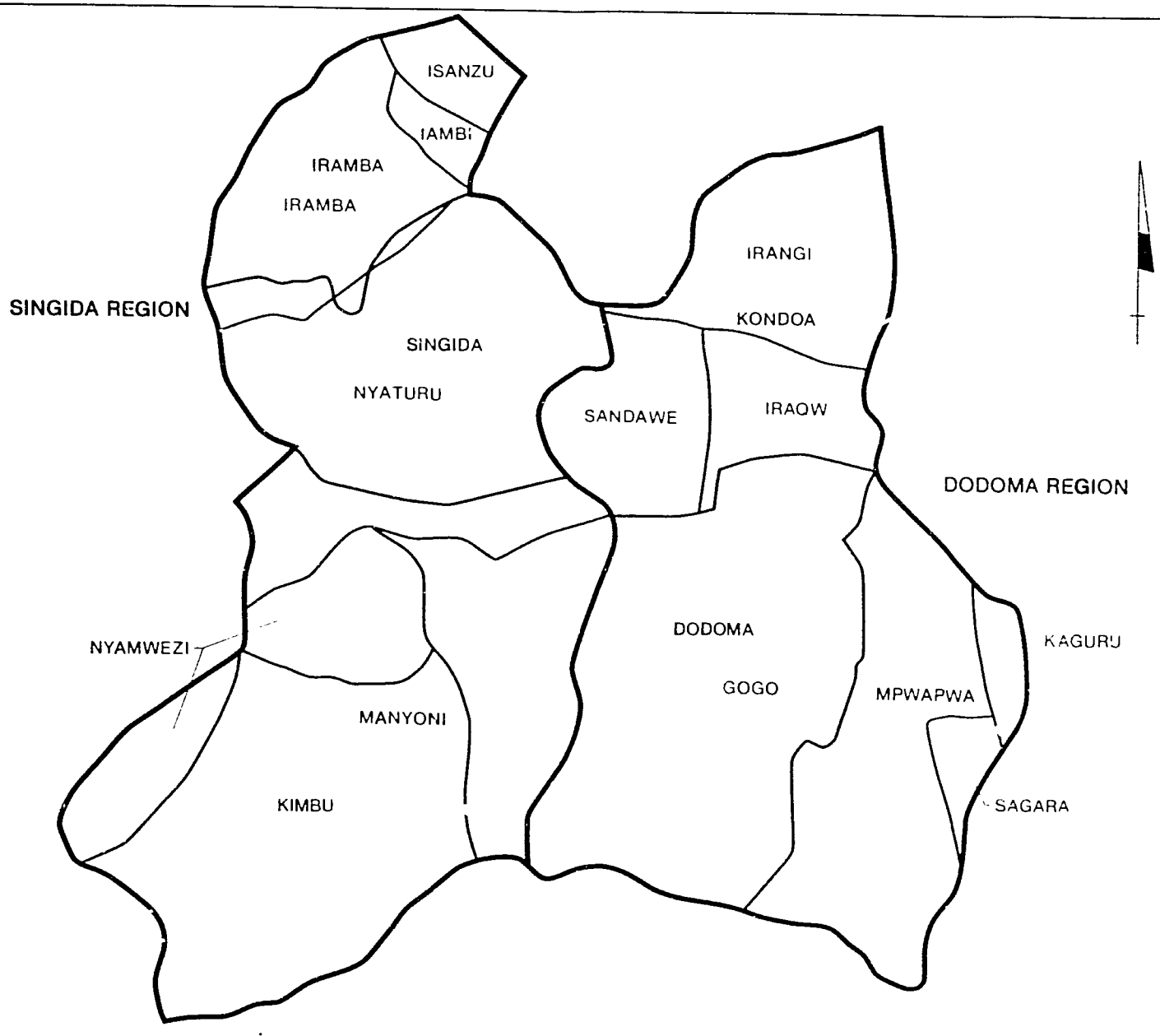
Legend

Railroad

Region

International Airport

Language Area



Legend

District Boundary

Ethnic Boundary

Tanzania
Singida and Dodoma Regions
Ethnic Groups
Plate IV-2

Tanzania Rural Roads
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TABLE IV- 1
TRIBAL COMPOSITION BY DISTRICTS[1/]

Region	District	Primary or Major Tribal Group(s)
Dodoma	Dodoma	Gogo
	Kondoa	Rangi Sandawe* Burungi*
	Mpwapwa	Gogo** Kaguru** Sagara**
Singida	Singida	Turu (also known as Nyaturu)
	Iramba	Iramba Iambi Isangu
	Manyoni	Turu** Nyamwezi** Kimbu** Gogo**
Kilimanjaro	Same	Pare
	Mwanga	Pare

1/ Based on Gulliver's.

*Non-Bantu peoples whose culture and languages differ significantly from most other Tanzanians.

**Although significant numbers of these people live within the named administrative district, they are primarily concentrated within another district.

the present study and the major ethnic groups who inhabit the area. In addition, Table IV-2 is based on the 1967 population census of Tanzania and shows the relative proportion of district population by ethnic group. Some comments about the latter are necessary.

(1) The urban and rural sectors of Dodoma and Singida districts are not separated since these administrative changes were made since the 1967 census.

(2) Some districts (specifically Dodoma, Singida, and Same/Mwanga) are relatively homogeneous ethnically. In each of these cases, a single ethnic group accounts for nearly the entire population with the remainder being divided among persons of several different groups.

(3) Other districts (specifically Mpwapwa and Manyoni) are diverse ethnically such that no single ethnic group accounts for as much as one-half the population.

(4) In two districts (Kondoa and Iramba), the population is ethnically complex but one ethnic group dominates in terms of the district's population.

(5) In many instances, ethnic groups are located within several administrative divisions--as for example in the case of the Gogo who constitute the majority of the population of Dodoma district as well as significant minority populations in Manyoni and Mpwapwa. Some groups, such as the Nyamwezi, Kaguru, and Sagara, who are found in sufficient concentrations to constitute significant minorities within the districts of concern, live primarily in adjacent regions and only "spill over" into the areas of concern.

All this points to a situation of considerable ethnic complexity--a mosaic of peoples, most of whom share cultural and linguistic similarities with one another, but whose traditional homelands seldom match district or regional administrative divisions within the governmental structure of Tanzania

Some evidence exists with regard to the urban situation in Dodoma township. Using data drawn from the 1967 Population Census, the tabulation below shows the ethnic diversity of Dodoma town. Although Dodoma itself is squarely within the traditional homeland of the Gogo people, they constitute only about one-fifth of the town's population. No other tribal group constituted more than 10 percent of the town's population. While figures are not

TABLE IV- 2
TRIBAL DISTRIBUTION BY DISTRICTS[1/]

Region	District	Tribe	Per Cent of District's Population
Dodoma	Dodoma	Gogo	85.5
		Other	14.5
	Kondoa	Rangi	65.6
		Sandawe	9.8
		Burungi	6.1
		Other	18.5
	Mpwapwa	Gogo	35.7
		Kaguru	24.3
		Sagara	7.1
		Other	32.9
Singida	Singida	Turu	91.1
		Other	8.9
	Iramba	Iramba	69.7
		Turu	14.0
		Isanzu	7.1
		Other	9.2
	Manyoni	Gogo	37.5
		Turu	16.3
		Kimbu	8.5
		Nyamwezi	5.1
		Other	32.6
Kilimanjaro	Pare	Pare	83.8
		Other	16.2

1/ These data are abstracted from Lucas and Philipson, "Ethnic Characteristics," Chapter 10 of The Population of Tanzania, An Analysis of the 1967 Population Census, edited by Egero and Henin, Dar es Salaam: BRALUP and Bureau of Statistics. Data are reported for administrative divisions as they existed at the time of the 1967 census enumeration.

available either for Dodoma in the most recent census or for Singida in either 1967 or 1978, these figures do suggest some important characteristics of the major urban center located within the area of our concern.

1967 POPULATION DISTRIBUTION OF DODOMA
TOWN BY TRIBAL GROUPS*

Tribe	Percent of Population
Gogo	19.9
Nyamwezi	9.3
Hehe	5.7
Rangi	4.7
Ngoni	3.9
Other	56.5

*These data are abstracted from Lucas and Philipson, "Ethnic Characteristics," Ch. 10 of The Population of Tanzania, An Analysis of the 1967 Population Census, edited by Egero and Henin, Dar es Salaam: BRALUP and Bureau of Statistics.

First, the Gogo are primarily a rural herding and farming people and have not migrated to Dodoma township in search of alternative means of livelihood. Second, Dodoma is not ridden with significant ethnic cleavages due to the low concentration of all the various ethnic groups which make up the town's population.

A final point about ethnic group distribution in Tanzania is in order. There has been an increasing trend in the Bureau of Statistics, as noted by Lucas and Philipson, page 175, to abolish the collection of census data by ethnic group. The purpose of this is to emphasize Tanzanian nationalism and unity as opposed to tribal differences and divisiveness. As Lucas and Philipson argue,

> "tribal (or ethnic) divisions continue to be important for many Tanzanians and until such time as these divisions are eradicated, it will be little good to ignore them. Rather, it might be more helpful to development planners to take cognizance of the significant differences which often exist among the peoples of a particular area and incorporate this information into the planning process. In line with this perspective, this report recognizes and discusses in the social anthropological appendices the differences found among the various ethnic groups in the area of concern. To be sure, there are many common Tanzanian

patterns. Yet, there remain many differences based on traditional cultures which may greatly affect the specific development plans of the Tanzanian government and/or foreign donors."

3. Population Size, Distribution and Density

Demographic statistics by administrative divisions are presented for each district in Dodoma, Singida, and eastern Kilimanjaro. Administrative Districts and Divisions are shown in Plates IV-3, IV-4, and IV-5. The administrative division population statistics were compiled from the enumeration data developed at the ward level from individual village resident responses during the 1978 national census.

A comparative summary of the 1978 Population Census for each of the study regions is presented as Table IV-3. An in-depth discussion of population growth and projections is presented in a following subsection. This summary exhibit provides an overview of the relationship among districts within regions, population growth, and population density. In terms of the three regions' percent of total mainland population--the Dodoma region represents the largest with 5.7 percent, followed by Singida at 3.6 percent, and the East Kilimanjaro area at 1.2 percent.[1/] The percent of the total mainland population represented by the study area is 10.5 percent.

Tables IV-4 through IV-8 present the base population statistics for the study regions of Dodoma, Singida and the Same and Mwanga districts of the Kilimanjaro region at the administrative division level.

These tables present the published data from the 1967 Census of Population, the provisional 1978 Census of Population data by administrative division and the calculated population densities. It should be noted that wide variations in population densities are exhibited within each district of a region and among districts within each of the study regions.

The relative size of population and population density by each administrative division provides indication of existing demands for transportation services--specifically road access to district centers. Demands for local social services and the products of the economic sectors are directly related to the size of the villages in each of the wards within the administrative divisions. Although the distribution of roads is not directly

1/ For the purposes of this study, the East Kilimanjaro area refers to the tow districts of Same and Mwanga.

0
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KONDOA DISTRICT
BEREKO
PAHI
KOLO
KONDOA
MONDO
KONDOA
KWAMTORO
GOIMA
FARKWA
ITISO
MUHDEMU
ZOISSA
CHAMWINO
KONGWA
DODOMA
MLALI
MPWAPWA
MPWIGULU
KIBAKWE
MPWAPWA DISTRICT
RUDI
DODOMA DISTRICT
Legend
Division
District
Region
Railroad
Trunk Road
Dodoma Region
Administrative
Districts and Divisions
Plate IV-3
Tanzania Rural Roads
Feasibility Study

Singida Region
Administrative
Districts and Divisions
Plate IV-4

Tanzania Rural Roads
Feasibility Study

Kilimanjaro Region
Administrative Divisions of
Same and Mwanga Districts
Plate IV-5

Tanzania Rural Roads
Feasibility Study

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TABLE IV-3

POPULATION AND DENSITY BY REGION AND DISTRICT OF THE STUDY AREA, 1967 AND 1978[1/]

Region/ District	Area (sq. kms.)	Population 1967	Population 1978	Absolute Change 1967-78	Percentage Change	Annual Average Growth, 1967-78 (Per Cent)	Population Density 1978 (Persons/sq. km.)
Dodoma							
Kondoa	13,209	212,195	275,082	62,887	29.6	2.4	20.8
Mpwapwa	11,526	176,186	261,525	85,339	48.4	3.7	22.7
Dodoma Rural	16,168	220,334	276,737	56,403	25.6	2.1	17.1
Dodoma Urban	406	100,665	158,577	57,912	57.5	4.2	390.6
Kilimanjaro							
Same/Mwanga	7,930	149,635	208,164	58,529	39.1	3.0	26.3
Singida							
Singida Rural	12,164	159,398	213,732	54,334	34.1	2.7	17.6
Singida Urban	657	34,421	55,892	21,471	62.4	4.5	85.1
Iramba	7,909	183,962	242,003	58,041	31.6	2.5	30.6
Manyoni	28,620	80,157	102,403	22,246	27.8	2.3	3.6
Tanzania	885,987	12,313,464	17,527,564	5,215,095	42.3	3.0	19.8

1/ National Census Bureau, Provisional Data, March 1980.

TABLE IV-4

DODOMA REGION POPULATION AND DENSITY BY DISTRICT AND ADMINISTRATIVE DIVISION, 1967 AND 1978

District	Administrative Division	Population 1967 1/	Population 1978 2/	Area (sq. km.) 3/	Population Density 1978 3/ (Persons per sq. km.)
Dodoma Rural	Itiso	-	29,585	3,335	8.8
	Chamwino	43,203	38,066	1,125	33.8
	Mvumi	37,084	40,282	799	50.4
	Mwitikira	30,305	36,216	3,692	19.8
	Chipanga	31,201	31,940	1,820	17.5
	Bahi	54,540	35,295	1,424	24.8
	Makangwa	21,281	28,526	2,260	12.6
	Mundemu	-	36,327	1,713	21.5
	Subtotal	220,334	276,737	16,168	17.1
Dodoma Urban	Hombolo	-	33,557	110	305.0
	Kikombo	-	24,509	120	204.0
	Nala	-	22,308	80	248.0
	Mpunguzi	-	15,666	70	199.0
	Urban Center	23,559	62,537	23	2,719.0
	Subtotal	100,665	158,577	406	390.6

1/ 1967 Census of Population, Bureau of Statistics.
2/ 1978 Provisional Census Data, National Census Bureau.
3/ Consultant Estimates and Calculations.

TABLE IV- 5

DODOMA REGION POPULATION AND DENSITY BY DISTRICT AND ADMINISTRATIVE DIVISION, 1967 AND 1978

District	Administrative Division	Population 1967 1/	Population 1978 2/	Area (sq. km.) 3/	Population Density 1978 3/ (Persons per sq. km.)
Mpwapwa	Mpwapwa	52,110	65,173	1,711	38.1
	Kibakwe	19,845	35,844	1,521	23.6
	Mlali	31,605	50,448	1,653	31.1
	Zoissa	2,429	33,225	1,405	23.6
	Kongwa	47,544	38,740	2,372	16.3
	Rudi	22,653	38,095	2,864	13.3
	Subtotal	176,186	261,525	11,526	22.7
Kondoa	Kondoa	4,514	31,513	520	60.6
	Mondo	37,049	47,076	669	70.4
	Farkwa	15,162	14,676	1,917	7.6
	Kwamtoro	15,972	25,977	2,471	10.5
	Pahi	39,461	51,208	3,123	16.4
	Goima	23,132	27,963	2,314	12.1
	Bereko	35,717	44,715	1,194	37.5
	Kolo	41,188	31,954	1,001	31.9
	Subtotal	212,195	275,082	13,209	20.8
	Total	709,380	971,921	41,309	23.5

1/ 1967 Census of Population, Bureau of Statistics.
2/ 1978 Provisional Census Data, National Census Bureau.
3/ Consultant Estimates and Calculations.

TABLE IV- 6

SINGIDA REGION POPULATION AND DENSITY BY DISTRICT AND ADMINISTRATIVE DIVISION, 1967 AND 1978

District	Administrative Division	Population 1967 1/	Population 1978 2/	Area (sq. km.) 3/	Population Density 1978 3/ (Persons per sq. km.)
Singida Rural	Ihanja	18,455	24,597	2,703	9.1
	Ikungi	-	29,242	3,613	8.1
	Mungaa	19,122	25,224	795	31.7
	Mtinko	-	58,133	3,173	18.3
	Mgori	17,114	22,098	1,216	18.2
	Ilongero	67,014	54,438	664	32.7
	Subtotal	159,398	213,732	12,164	17.6
Singida Urban		34,421	55,892	657	85.1
Iramba	Kirumi	23,106	31,929	1,954	16.4
	Nduguti	31,649	43,220	852	50.7
	Kinyangiri	25,804	27,145	1,078	25.2
	Kinampanda	-	29,679	688	53.0
	Kisiriri	-	36,454	986	36.9
	Ndago	31,649	37,690	1,309	28.8
	Shelui	27,603	35,886	1,042	34.4
	Subtotal	183,962	242,003	7,909	30.6

1/ Census of Population, Bureau of Statistics.
2/ Provisional Census Data, National Census Bureau.
3/ Consultant Estimates and Calculations.

TABLE IV- 7

SINGIDA REGION POPULATION AND DENSITY BY DISTRICT AND ADMINISTRATIVE DIVISION, 1967 AND 1978

District	Administrative Division	Population 1967 1/	Population 1978 2/	Area (sq. km.) 3/	Population Density 1978 3/ (Persons per sq. km.)
Manyoni	Manyoni	-	15,358	572	26.8
	Itigi	35,709	17,905	15,823	1.1
	Manyoni Vijijini	-	13,214	607	21.8
	Kintinku	30,353	18,434	2,037	9.0
	Nkonko	14,095	37,492	9,581	3.9
	Subtotal	80,157	102,403	28,620	3.6
	Total	457,938	614,030	49,350	12.4

1/ Census of Population, Bureau of Statistics.
2/ Provisional Census Data, National Census Bureau.
3/ Consultant Estimates and Calculations.

TABLE IV- 8

SAME AND MWANGA DISTRICTS POPULATION AND DENSITY BY ADMINISTRATIVE DIVISION, 1967 AND 1978

District	Administrative Division	Population 1967 1/	Population 1978 2/	Area (sq. km.) 3/	Population Density 1978 3/ (Persons per sq. km.)
Same	Same	24,957	15,080	1,570	9.6
	Mwembe Mbaga	-	26,429	2,110	13.0
	Gonja	21,142	17,800	250	71.0
	Chome/Suji	24,142	23,524	1,540	15.0
	Mamba Vunta	-	23,716	220	108.0
	Ndungu	-	27,176	900	31.0
	Subtotal	-	133,725	6,590	20.3
Mwanga	Ugweno	24,018	25,032	230	109.0
	Usangi	25,942	20,013	460	44.0
	Mwanga	-	13,742	480	29.0
	Lembeni	-	14,843	170	87.3
	Subtotal	-	73,630	1,340	54.9
	Total	207,355		7,930	26.3

1/ Census of Population, Bureau of Statistics.
2/ Provisional Census Data, National Census Bureau.
3/ Consultant Estimates and Calculations.

related to present settlement patterns, because of the villagization program, the requirements for access, and therefore road improvements to the existing system, are related to population distribution and concentrations (population density).

The size and concentrations of population were employed in the comparative evaluation of the competitive merits of rural road improvements for each of the study regions by administrative division within each district, and among districts within each region.

Within the Dodoma region the range of population size is distributed from a low of 14,676 in the Farkwa division of the Kondoa district to a high of 65,173 in the Mpwapwa division of the Mpwapwa district. The population densities range from a low of 7.6 persons per square kilometer in the Farkwa division of Kondoa to well over 100 for all divisions in the Dodoma Urban district. Within the Dodoma region the distribution of district population size, as a percent of regional population, is 28, 16, 27, and 28 percent for the Dodoma Rural, Dodoma Urban, Mpwapwa, and Kondoa districts respectively. The percent distribution of population within each district is presented in Tables A-1 through A-3 in the appendix.

The range of population size in the Singida region includes a low of 13,214 in the Manyoni Vijijini division of the Manyoni district to a high of 58,133 in the Mtinko division of the Singida Rural district. Densities range from a low of 1.1 persons per square kilometer in the Itigi division of the Manyoni district to a high of over 50 in the Kinampanda and Ndujuti divisions of the Iramba district, and 85 in the Singida Urban district. Within the Singida region the distribution of district population size, as a percent of regional population, is 35, 9, 39, and 17 percent for the Singida Rural, Singida Urban, Iramba, and Manyoni districts, respectively.

The highest population in the study district of Kilimanjaro is reported in the Mwembe Mbaga division of the Same district, while the lowest is the Mwanga division of the Mwanga district. Population densities range from a low of 15 persons per square kilometer in the Mwembe Mbaga division to a high of 109 in the Ugweno division of the Mwanga district.

Within the Kilimanjaro region the distribution of district population size, as a percent of regional population, is 64, and 36 for the Same and Mwanga districts respectively.

Several caveats should be observed in the interpretation of the population data. The first involves comparison of 1967 data with 1978 data, and the second

involves the nature of the present administrative classifications of "rural" and "urban" areas.

Although 1967 and 1978 population statistics are available at the administrative division level for most of the jurisdictions in each district, the data cannot be compared directly to compute growth rates and conduct comparative demographic analyses. This is due to the fact that the definition and boundaries of administrative divisions and wards has changed between the 1967 and 1978 census through refinements in the census framework, administrative boundary changes, and the results of the villagization programs. As such it will be noted that although the district population totals for 1967 can be compared with 1978 data, since district boundaries did not change significantly (with the exception of the Pare district of East Kilimanjaro), the administrative division population data for 1967 are partial and do not total. Although much effort was devoted through comparison of village data and boundary definitions, it became clear that there is no way to compare the results of the two censuses at the level of jurisdictional refinement necessary in support of this study. This observation should in no way be interpreted as a criticism of national, regional, and district comparative analyses which will be conducted in the ongoing analyses and reduction of the 1978 census data by the Census Bureau. It should be noted only that at the lowest levels of disaggregation (village, ward and administrative division) the data are not comparable for reasons totally beyond control.

There is a great opportunity for misinterpretation with respect to the distinction between jurisdictions (districts) classified as rural and urban. This stems from the fact that these classifications have been rather arbitrarily applied for administrative distinction. Confusion exists as to whether to classify regional and/or district headquarters as "urban areas," since in the case of the Dodoma Urban and Singida Urban districts they include large areas which are rural.

At the national level it is noted that the percent of the total population in the "urban population" category has increased from 5 percent in 1960 to 9 percent in 1975. This trend is supported by 11.5 percent of the 1978 population for the Dodoma region being classified

as urban. It is envisioned that an analysis of this demographic distinction, trends, and perspectives will be addressed in the 1978 Population Census series.

4. Other Characteristics

Table IV-9 gives selected characteristics of the populations of Dodoma and Singida regions, and the Same/Mwanga districts of Kilimanjaro region as they will appear in the 1978 census when published. These data show that the areas of concern account for just over 10 percent of the total Tanzanian population. The data are analyzed with respect to age distributions, sex ratios, and household sizes of the districts for the 1978 census period, and are compared with one another and with the national averages.

With regard to age distribution, extreme caution must be exercised when a fine calibration of the data is attempted. Since only broad age groups are being examined here, little concern need be expressed in analyzing the general population characteristics. These data show a heavily skewed population with nearly half of the country's population under 14 years of age. Slightly more than another quarter of the population falls between 15 and 34 years of age. A final quarter or thereabouts is above the age of 35 years. This profile reflects a growing population which will rapidly increase in size within a short period of time. Needs of the population, demand for essential social services and so on, can be expected to increase considerably within the next few years and continue to do so within the foreseeable future.

When the districts are examined for internal differences in the age structure, no great deviations from the national averages are noted.

With regard to the sex ratio and the mean household size, it is also the case that there are neither great differences

TABLE IV-9
SELECTED CHARACTERISTICS OF THE POPULATIONS OF DODOMA, SINGIDA, AND KILIMANJARO REGIONS IN 1978*

Region	District	Total Population	Age Distribution (%) 0-14	15-34	35+	Per Cent Male	Mean Household Size
Dodoma	Dodoma Rural	276,737	45.9	28.2	25.9	46.5	4.3
	Dodoma Urban	158,577	45.2	28.9	25.8	47.0	4.9
	Mpwapwa	261,525	47.5	30.1	22.3	48.8	5.3
	Kondoa	275,082	47.4	30.3	22.2	48.0	4.8
Regional Totals		971,921	46.7	29.4	23.9	47.6	4.8
Singida	Singida Rural	213,732	45.7	27.9	27.8	47.5	4.6
	Singida Urban	58,892	43.5	33.2	23.3	46.6	4.6
	Iramba	242,003	46.8	25.5	27.7	47.3	4.6
	Manyoni	102,403	42.3	28.5	29.2	46.8	4.4
Regional Totals		614,030	45.4	27.6	27.1	47.3	4.6
Kilimanjaro	Same	133,725	49.4	25.5	25.1	48.5	5.5
	Mwanga	73,630	51.7	25.3	23.0	48.6	5.4
Subregional Totals		207,355	50.2	25.4	24.3	48.5	5.5
Totals for Tanzania		17,527,564	46.1	30.5	23.4	49.0	4.8

*These data were provided in advance of the publication of the 1978 census figures by the Bureau of Statistics.

among the districts or between the areas of concern and the national averages. This suggests that Tanzania's national policy of rural, decentralized development is operating to maintain the balance of males to females and the household size within all these areas. If there were significant outmigration of males for cash earning in urban centers, for example, this fact would probably be reflected in great differences in the sex ratio and household size. Since this is not the case for either the predominantly rural areas or the urban ones, the population profile would suggest that the areas of concern are rather typical for Tanzania as a whole and do not represent any outstanding or significant departures from the national patterns.

5. Labor Force, Employment, and Wages

This section provides a summary of unpublished statistics on sector employment and wages at the district and regional level, and per capita income profiles for the study regions. A national survey and census of employment and wages is currently in progress in Tanzania. The results of this Bureau of Statistics census will be available within the next year or two.

Sector employment and wage bill data presented in the section have been compiled from unpublished statistics for the years 1976 and 1978, and published 1975 data from the Economic Survey.[1/] A summary of sector employment and wages for the study regions are presented in the tabulation below.

Approximately 48 percent of the population is in the potential labor force (ages 15 - 64). Of this potential labor force numbering about 8.5 million people, approximately 511,000 were employed on a wage basis. Nationally, this represents 6.0 percent of the labor force. The percentage of labor force receiving wages in 1978 was 3.8, 2.2, and 6.4 percent for the Dodoma, Singida, and Kilimanjaro

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1/ The Economic Survey, 1977/78, United Republic of Tanzania, printed by the Government Printer, 1979.

regions respectively. The majority of the labor force is engaged in the agricultural sector at the subsistence level and do not receive wages.

A regional and district comparison of employment and wages is presented as Table IV-10. This exhibit provides an indication of comparative number of firms and/or public service units, wage earning employees, and annual wage bill for each of the study regions. As would be expected the largest number of establishments and employees are centered in the urban districts of both the Dodoma and Singida regions. The per cent of the total regional establishments represented by the Dodoma Urban and Singida Urban districts is 64 per cent and 48 per cent respectively. In terms of corresponding employment the Dodoma Urban district represents 69 per cent of the Dodoma region employment, while the Singida Urban district represents 46 per cent.

In terms of average employee wage, the range for 1976 extends from a low of 5,400 T/shs per year in the district of Kilimanjaro to 5,545 T/shs per year in the Singida region and to a high of 7,218 T/shs per year in the Dodoma region. On a national basis the average wage earner's income for 1976 was 5,695 T/shs.

Detailed employment and wage bill data by major employment sector are shown in the Appendix. Employment and earnings for the Dodoma region are presented in Tables A-IV-4 through A-IV-8. Singida region and Kilimanjaro region (Same and Mwanga districts) are presented in Tables A-IV-9 through A-IV-13, and Table A-IV-14 respectively.

On a national basis, the per cent increase in employment between 1973 and 1976 was 1.2 per cent (see Table A-IV-15). Although the growth in the annual wage bill over the 3-year period indicates an increase of approximately 26 per cent in current prices, there was actually a decrease in per wage earner income when the national inflation rate is applied. It should be noted that the public administration and community services sector represent approximately 23 per cent of the total Tanzanian employment in 1978. There has been a rapid expansion of social services and public employment over the last decade which is exerting pressure on the government's recurring budget.[1/]

1/ The World Bank, Two Studies of Development in Sub-Saharan Africa, Working Paper 300, October 1978, p. 58.

TABLE IV-10
REGIONAL AND DISTRICT COMPARISONS OF 1976 INDUSTRIAL EMPLOYMENT AND WAGE BILLS

	Number of Establishments	Per Cent of Establishments	Number of Employees	Per Cent of Employees	Annual Wage Bill (Million T/shs)	Per Cent of Wages
Dodoma Region						
Dodoma Rural	19	9.3	2,328	13.4	13.5	10.7
Dodoma Urban	131	64.5	11,961	68.8	89.2	71.0
Mpwapwa	29	14.3	1,813	10.4	10.0	8.0
Kondoa	24	11.9	1,277	7.4	12.9	10.3
Total	203	100.0	17,379	100.0	125.6	100.0
Singida Region						
Singida Rural	19	12.7	368	5.9	1.6	4.6
Singida Urban	72	48.0	2,868	45.9	15.4	44.5
Iramba	24	16.0	1,320	21.2	7.8	22.5
Manyoni	35	23.3	1,684	27.0	9.8	28.4
Total	150	100.0	6,240	100.0	34.6	100.0
Kilimanjaro						
Same/Mwanga	31	100.0	3,487	100.0	18.9	100.0
Tanzania	5,281		478,253		2,724.1	

Source: Bureau of Statistics, Dar Es Salaam (unpublished data).

A summary of regional gross domestic product and per capita income is presented in the following tabulation.

REGIONAL SUMMARY OF GROSS DOMESTIC PRODUCT
AND PER CAPITA INCOME
(Current Prices)

Region	Gross Domestic Product (million T/shs) 1/			Per Capita Income (million T/shs) 1/			Per Capita Per Cent Increase 1972-1976	Per Capita Per Cent Increase 1972-1976 Adj. for Inf.
	1972	1974	1976	1972	1974	1976		
Dodoma	415	445	650	525	538	750	+42	-33
Singida	233	260	492	477	517	948	+99	+12
Kilimanjaro 2/	557	745	1,237	727	913	1,419	+95	+10
Tanzania	10,032 3/	14,010 3/	20,354 3/	687	902	1,234	+80	+ 1

1/ Bureau of Statistics (unpublished figures).
2/ Same and Mwanga districts cannot be separated from Kilimanjaro regional statistics.
3/ The Economic Survey, 1977/78, United Republic of Tanzania, printed by The Government Printer, 1979, p. 9.
4/ Bank of Tanzania, National Consumer Price Index, Economic Bulletin, Vol. X, No. 3, December 1978.

In real per capita income (adjusted for inflation) the changes in income over the 1972-1976 period are: minus 33 per cent for Dodoma, plus 12 per cent for Singida, and plus 10 per cent for Kilimanjaro regions respectively. The inflation rates (developed by the Bank of Tanzania) employed in the per capita income statistics are presented below.

CONSUMER PRICE INDEX 1/

Year	General Index
1970	100.0
1971	104.7
1972	112.7
1973	124.5
1974	148.4
1975	187.7
1976	200.6
1977	223.8
1978	249.3

Future analysis by the Bureau of Statistics through the 1978 census data, and the current survey of employment, industry and wages should

1/ Bank of Tanzania, National Consumer Price Index, Economic Bulletin, Vol. X, No. 3, December 1978.

provide detailed data at the administrative division level for continuing analysis of the potential impacts of infrastructure investments.

6. Projections

The total population of Tanzania has more than doubled over the past thirty years. From about 8 million in 1948, the population rose to 17.5 million by 1978, an annual average increase of 2.7 per cent. The increase has been continuous and rising rapidly throughout the period with the annual average rate growing from 2.1 per cent in the 1948-1957 census period to 2.5 per cent, 1957-1967 and to 3.0 per cent in the latest census period, 1967-1978 (see Table IV-11). This latter growth rate is well above the 2.5 per cent annual average recorded for all of Africa in the 1970-75 period.[1/]

In contrast to the national growth, the three regions of the present study (Dodoma, Singida, and Kilimanjaro) had varying annual average growth rates ranging from a low of 0.5 per cent for Singida region from 1948-1957 to a high of 3.3 per cent for the Kilimanjaro region in the same period (see Table IV-11). Throughout the thirty-year period, the annual average growth rate of Singida region has been below that of the national average. In the case of Dodoma region, the annual average growth rate was substantially below the national average in 1948-57, above the national average in 1957-67 and somewhat below the national average in 1967-78. Both Dodoma and Singida experienced the same annual average growth rate of 2.7 per cent in the 1967-78 period. For the Same/Pare area of the Kilimanjaro region (now known as the Same and Mwanga districts, the only districts of the region included in this study), the annual average growth rate was well above the national average of 3.0 per cent in the latest period, 1967-78 (see Table IV-11).

Mpwapwa has been the fastest growing district in the Dodoma region throughout the 1948-78 period, with annual average population growth rates ranging from 1.5 to 4.3 per cent (Table IV-11). Agricultural-wise this district is favored over the others of the region

1/ In accordance with the United Nations Population Division medium variant, see Selected World Demographic Indicators by Countries, 1950-2000 (ESA/P/WP. 55), May 25, 1975, as cited in Dodoma Interim RIDEP, Working Papers, Vol. II, Annex VI, Population and Demography Study, p. VI-2. The annual average growth rate cited for Tanzania in the UN study was 2.9 per cent for the 1970-75 period.

TABLE IV - 11

POPULATION - TANZANIA AND STUDY REGIONS, HISTORICAL AND PROJECTED TO 1990

REGIONS AND DISTRICTS	Population				Percentage of Total				Annual Average Growth Rate			Population Projections		
	1948	1957	1967	1978	1948	1957	1967	1978	1948/57	1957/67	1967/78	1990	% of Total	Annual Average Growth Rate 1978-1990
Dodoma														
Dodoma Urban)	209,431	226,200	77,106	96,040	44.9	44.0	10.9	9.9	0.9	2.8	1.8	145,000	10.2	3.5
Dodoma Rural)			220,334	276,737			31.1	28.5			1.9	351,000	24.6	2.0
Mpwapwa	101,557	115,950	176,186	261,525	21.8	22.5	24.8	26.9	1.5	4.3	3.3	379,000	26.6	3.4
Kondoa	145,777	166,836	212,195	275,082	31.3	30.9	29.9	28.3	1.0	2.9	2.2	357,000	25.1	2.2
Subtotal	456,765	500,986	685,821	909,384	98.0	97.4	96.7	93.6	1.0	3.2	2.6	1,232,000	86.5	2.8
Dodoma Town	9,414	13,435	23,559	62,537	2.0	2.6	3.3	6.4	4.0	5.8	9.3	193,000	13.5	9.8
Region Total	466,199	514,421	709,380	971,921	100.0	100.0	100.0	100.0	1.1	3.3	2.7	1,425,000	100.0	3.2
Singida														
Singida Rural	168,891	162,706	159,338	213,732	47.6	43.7	34.8	34.8	0.4	1.8	2.7	268,000	35.3	2.8
Iramba	133,410	150,577	183,652	242,003	37.6	40.4	40.2	39.4	1.4	2.0	2.3	322,000	38.1	2.4
Manyoni	52,647	59,254	80,187	102,403	14.8	15.9	17.5	16.7	1.3	3.1	2.2	130,000	15.4	2.0
Subtotal	354,948	372,537	423,517	558,138	100.0	100.0	92.5	90.9	0.5	2.1	2.3	750,000	88.8	2.5
Singida Urban	1/	1/	34,421	55,892	1/	1/	7.5	9.1	1/	1/	4.5	95,000	11.2	4.5
Region Total	354,948	372,537	457,938	614,030	100.0	100.0	100.0	100.0	0.5	2.1	2.7	845,000	100.0	2.7
Kilimanjaro														
Kilimanjaro	259,646	351,255	476,223	2/	73.4	74.1	73.0	2/	3.4	3.1	2/	3/	3/	3/
Moshi Town	8,048	13,726	26,864	2/	2.3	2.9	4.1	2/	6.1	6.9	2/	3/	3/	3/
Same/Pare	85,789	108,508	149,635	207,355	24.3	23.0	22.9	23.0	2.7	3.2	3.0	289,000	-	2.3
Mwanga 4/	N/A	N/A	N/A	(73,630)	-	-	-	(8.2)	-	-	--	101,000	-	2.7
Same 4/	N/A	N/A	N/A	(133,725)	-	-	-	(14.8)	-	-	-	188,000	-	2.9
Region Total	353,483	473,889	652,722	902,394	100.0	100.0	100.0	2/	3.3	3.2	3.0	-	-	-
Total Tanzania	7,881,000	9,601,000	12,313,000	17,528,000	-	-	-	-	2.1	2.5	3.0	24,991,000	-	3.0

1/ Included in Singida Rural.

2/ Districts were changed in the 1978 Census thus 1967-78 comparisons are not possible.

3/ Not a part of this study area.

4/ New districts formed from the former Same/Pare district in 1978.

Source: Historical data are from BRALUP and Bureau of Statistics, The Population of Tanzania, Vol. 6, "An Analysis of the 1967 Population Census", edited by Bertil Egero and Roushdi A. Benin, Appendix Tables to Chapter 14, pp. 288-289. Projections are by the Consultant except for that of Dodoma Town. The latter is an average of the three projections utilized in the Dodoma Interim Rdpp, Working Papers, Vol. II, Annex VI, p. VI-28 from Office of the Regional Development Director, Dodoma, January 1980.

in terms of annual rainfall and soil capability.

The Kondoa district, the second fastest growing district in the region, experienced annual growth rates over the same period, ranging from 1.0 to 2.9 per cent. It, in turn, was followed closely by the two remaining districts of Dodoma Urban and Dodoma Rural.

Annual average growth rates for Dodoma town were computed by the consultant based upon the official census data as shown in Table IV-11. The rapidly rising growth rates of 4.0, 5.8, and 9.3 per cent for the census periods of 1948-57, 1957-67, and 1967-78 respectively, reflect the small base at the beginning of the period, and the decision in recent years to convert Dodoma town into the nation's new capital. As a result of this decision, there has been an influx of population from other parts of the region as well as from outside the region into Dodoma town. Among the three districts of Singida region, Manyoni registered the greatest annual growth rates during the period 1948-1967 (1.3 per cent in the first half of this period, 3.2 per cent in the latter half). In the twelve-year period, 1967-78, however, Manyoni was replaced by Singida Rural as the fastest growing district (see Table IV-11). Iramba District's growth rate has been at about the average of the three districts over the 30-year period, with the exception of the first nine years, when its annual rate was well above the average due to the negative rate registered by Singida Rural during that period.

The variation in annual growth rates among the districts of Dodoma and Singida is reflected in the changing relative shares of each of the districts to the regional totals as shown in Table IV-11. Historical growth rate data are not available for the two districts of Same and Mwanga on an individual basis, since Mwanga was only recently delineated as a separate district from that of Mwanga. For the two districts combined (referred to in Table IV-11 as Same/Pare), the annual average growth rate ranged from 2.7 to 3.2 per cent over the 1948-78 period.

The 1967-78 annual growth rate of 3.0 per cent for the two combined districts was equal to that of the region and the nation for the same period.

Historical growth rates could not be computed at the administrative division level within each district since comparable data were not

available.[1/]

The methodology utilized by the consultant in projecting population at the administrative division level was to first determine the projection for the nation as a whole for the time period ending with December 31, 1990. This forecast was then followed by projections for the same time period at the regional and district levels of the study areas, and finally, projections were made for each of the administrative divisions within each district.

Various studies were analyzed with reference to the population projection for the nation through 1990. For example, the World Bank's World Development Report, 1979 Annex: World Development Indicators, shows the population of Tanzania at 16.4 million in mid-1977 with an annual average growth rate of 3.0 per cent 1970-77. This population is then projected from the base year 1975 reflecting general information on the total population, fertility and mortality rates and assumptions through the projected year 2000.[2/] The country's population is estimated at 32 million by the end of the year 2000, which represents an annual average growth rate of 3.0 per cent. Utilization of this rate through the year 1990 gives a projected population for that year of about 25 million. Similar information is presented in the Dodoma Interim RIDEP, Working Papers, Vol. II, Annex VI, Population and Demographic Study, pp. VI-24, VI-25. The 3.0 per cent growth rate registered by the nation's population in the 1967-73 period is extrapolated by the consultant until the end of 1990. This gives an estimated population of about 25 million for that year (Table IV-11).

Projections for Dodoma region were first made without Dodoma town (the new capital), and to this projection was added the estimated population for Dodoma town as of the end of the year 1990. The projection of Dodoma town at an annual average growth rate of 9.8 per cent, resulting in a population of 193,000, represents the mean of three assumed growth rates contained in Annex VI, of the Dodoma Interim RIDEP, Working Papers. In light of the inflation and energy pressures being experienced by the Tanzanian economy, the 9.8 per cent rate (slightly

1/ For further discussion of this fact, see section A-1 on size and distribution of the population.
2/ The base year estimates are from the UN "Demographic Estimates and Projections for the World, Regions and Countries as Assessed in 1978: Provisional Report 1979," the World Bank, the U.S. Bureau of the Census, and the Population Council, p. 132 of World Development Report.

above that of the previous twelve years) appears to be a reasonable expectation. The higher growth rate predicted for Dodoma Urban, in contrast to Dodoma Rural, is based upon the assumption of a spill-over effect of the expanding new national capital into the adjoining Dodoma Urban areas. The projected growth rate for Mpwapwa district is projected as increasing slightly over the historical rate, 1967-78, while that of Kondoa district is expected to remain at the same level as its 1967-78 rate. Similarly in the case of Singida region, the consultant first projected the regional population without Singida Urban, and then followed up with the Urban projection, to arrive at the regional total.

It has been previously mentioned that a relatively strong urban trend is prevalent throughout Tanzania. This can be seen in the 4.5 per cent annual growth of Singida Urban during the 1967-78 period, compared with the regional growth without Singida Urban of 2.3 per cent for the same period (see Table IV-11).

The districts of Singida Rural and Iramba are predicted as increasing their annual growth rates slightly over the 1978-1990 period, while Manyoni district is expected to have a slight decline in its rate. A possible offset to the decrease in the Manyoni district growth rate could develop through an expansion in the district headquarters at Manyoni. The town of Manyoni is located on the railroad, and it does serve, to a limited extent, as a transshipment point for grain and livestock moving out of the region and inputs into the region, especially so for the districts of Manyoni and Singida Rural.

The annual average growth rates for the combined Mwanga-Same districts of the Kilimanjaro region reached their peak of 3.2 per cent in the twelve-year period, 1967-78 (see Table IV-11). Of course, even the 3.0 per cent growth rate is still a high rate. In view of this, the consultant has predicted that the downward trend experienced by the combined districts over the 1967-78 period will continue over the next twelve-year period, 1978-1990. The rate for the combined districts is thus projected at 2.8 per cent, with that of Mwanga dropping to 2.7 per cent and that of Same to 2.9 per cent. The anticipated difference in the annual growth rates is based upon the known facts that most of the population of the two districts live in

the mountains rather than the plains; and that the density in the mountains is at a high level. For example, in Mamba Vunta division of Same district and Ugweno division in Mwanga district, the population densities in the order stated reach 108 and 109 persons per square kilometer.[1/] Other divisions would also show higher densities than those reported in Table IV-6 if the areas were restricted to the mountains, and thus did not include plains where only a relatively small percentage of the population lives.

Another possible factor in the projections is that a limited number of the men (heads of households) leave the Mwanga district in particular and work elsewhere in such areas and cities as Moshi, Arusha, Tanga, and Dar es Salaam. Money is then sent home to support their families.

In the absence of historical growth rate data at the administrative division level to serve as a guide for the 1990 projections, the consultant determined the percentage distribution of each of the districts' 1978 population among the divisions of the particular district. He then estimated to what extent the percentage distribution of the divisions would change, and thus the projected annual average growth rates of the divisions would be above, at the same level, or below the projected district rate. Among the factors given consideration in the division percentage distributions for 1990 were the 1978 density figures, agricultural potential and urban development. The projections by administrative divisions are shown in Tables A-IV-16 through A-IV-20.

B. Health

An examination of health facilities, services, and the relationship between health services and the access opportunities provided by the road system was conducted as part of the field surveys. Interviews were conducted with the functional managers of health services at the district level. The functional managers serve as the district medical officers and as such were able to supply both statistical data and experienced insight as to the potential impacts of improving the rural access roads. These interviews were augmented through reference to the 1978 Regional Health Facility Inventory currently being completed by the Ministry of Health. This inventory, sponsored by Scandinavian countries, USAID,

1/ Most of the areas of these two divisions are in the mountains.

and UNICEF will be followed by an evaluation of health sector needs, plans, and resource requirements. This section has been prepared to serve as a backdrop for understanding the current status of the health sector for the Dodoma, Singida, and Same/Mwanga districts of Kilimanjaro, and more importantly the class of health delivery systems problems which relate specifically to the condition of the existing roads.

1. Facilities, Personnel, and Services

The types of health facilities which are within the regions include hospitals, rural health centers, dispensaries, and first aid stations. Data at the administrative division level as to existing facilities were collected with respect to facility, distribution, people served, and number of medical personnel (doctors). It should be noted that first aid stations (boxes) were not identified because the majority of villages have a box, and the transport problems associated with providing first aid supplies to the boxes apply equally to the entire study area. Hospitals prior to 1980 have been both government and private (mission). As of 1980, the national government plans to bring all medical facilities under government control.

A summary of regional health services at the region and district level is presented as Table IV-12. This summary has been supplemented with a computation of the doctor/population ratio in Table IV-13. Although there are a large number of medical support personnel and paramedicals included in inventory of health delivery personnel, the doctor/population ratios were computed to include Medical Officers (M.O.'s) and Assistant Medical Officers (A.M.O.'s) since these two categories represent experienced physicians who provide direct professional health care.

An inventory of health facilities for each study district at the administrative division level is presented in Tables IV-14 through IV-16. It was essential in the comparative analysis of road improvement needs and impacts to develop a surrogate factor to represent all health services by administrative division. This factor, referred to as the weighted health service factor, was developed to include the number of hospitals, Rural Health Centers, and dispensaries by administrative division with respect to the population of the division. The factor was computed as a weighted sum as

TABLE IV-12
REGIONAL HEALTH SERVICES SUMMARY--1978

Region	District	1978 Population	Number of Hospitals	Persons Per Hospital	Total Rural Health Centers	Persons Per Rural Health Center	Total Dispen-saries	Persons Per Dispensary
Dodoma								
	Dodoma Rural	276,737	1	276,737	4	69,184	51	5,426
	Dodoma Urban	158,577	4	39,644	2	79,288	25	6,343
	Mpwapwa	261,525	1	261,525	4	65,381	40	6,538
	Kondoa	275,082	1	275,082	4	68,770	42	6,550
	Total	971,921	7	138,714	14	69,421	158	6,151
Singida								
	Singida Rural	213,732	1	213,732	3	71,244	27	7,916
	Singida Urban	55,892	1	55,892	1	55,892	2	27,946
	Iramba	242,003	2	121,001	3	80,667	27	8,963
	Manyoni	102,403	2	51,201	4	25,600	18	5,689
	Total	614,030	6	102,338	11	55,821	74	8,298
Kilimanjaro								
	Same	133,725	2	66,862	2	66,863	34	3,933
	Mwanga	73,630	1	73,630	1	73,630	17	4,331
	Total	207,355	3	69,118	3	69,118	51	4,066

Source: 1978 Health Facilities Inventory, Tanzania Ministry of Health, 1980.

TABLE IV-13

NUMBER OF PERSONS SERVED BY MEDICAL DOCTORS, REGION AND DISTRICT SUMMARY, 1978

Region	District	1978 Population	Medical Doctors	Doctor/Population Ratio
Dodoma				
	Dodoma Rural	276,737	5	1/55,347
	Dodoma Urban	158,577	25	1/6,343
	Mpwapwa	261,525	4	1/65,382
	Kondoa	275,082	4	1/68,770
	Total	971,921	38	1/25,577
Singida				
	Singida Rural	213,732	4	1/53,433
	Singida Urban	55,892	1	1/55,892
	Iramba	242,003	4	1/60,501
	Manyoni	102,403	3	1/34,134
	Total	614,030	12	1/51,169
Kilimanjaro				
	Same	133,725	2	1/66,862
	Mwanga	73,630	2	1/36,815
	Total	207,355	4	1/51,838

Source: 1978 Health Facilities Inventory, Tanzania Ministry of Health, 1980.

TABLE IV-14
DODOMA REGIONAL HEALTH FACILITIES BY DISTRICT AND ADMINISTRATIVE DIVISION, 1978

District	Administrative Division	Number of Hospitals	Number of Rural Health Centers	Number of Dispensaries	Weighted Health Service Factor
Dodoma Rural					
	Itiso	–	–	8	1/3698
	Chamwino	–	–	7	1/5438
	Mvumi	1	1	3	1/1678
	Mwitikira	–	1	9	1/2587
	Chipanga	–	1	5	1/3194
	Bahi	–	–	7	1/5042
	Makangwa	–	–	7	1/4075
	Mundemu	–	1	5	1/3683
	Total	1	4	51	1/3181
Dodoma Urban					
	Hombolo	1	1	7	1/1198
	Kikombe	–	–	2	1/12,254
	Nala	–	–	2	1/11,154
	Mpunguzi	–	–	5	1/4462
	Urban Center	3	1	9	1/1009
	Total	4	2	25	1/1602
Mpwapwa					
	Mpwapwa	1	–	7	1/2834
	Kibakwe	–	1	7	1/2987
	Mlali	–	1	7	1/4204
	Zoissa	–	–	5	1/6645
	Kongwa	–	1	6	1/3522
	Rudi	–	1	8	1/2980
	Total	1	4	40	1/3441

TABLE IV-14

DODOMA REGIONAL HEALTH FACILITIES BY DISTRICT AND ADMINISTRATIVE DIVISION, 1978

District	Administrative Division	Number of Hospitals	Number of Rural Health Centers	Number of Dispensaries	Weighted Health Service Factor
Kondoa					
	Kondoa	1	-	1	1/1854
	Mondo	-	-	6	1/7846
	Farkwa	-	-	5	1/2935
	Kwamtoro	-	1	5	1/2598
	Pahi	-	1	7	1/4267
	Goima	-	1	7	1/2330
	Bereko	-	1	6	1/4065
	Kolo	-	-	4	1/7988
	Total	1	4	42	1/3572
Total		7	14	158	1/2061

Source: 1978 Health Facilities Inventory, Tanzania Ministry of Health, 1980.

TABLE IV-15
SINGIDA REGIONAL HEALTH FACILITIES BY DISTRICT AND ADMINISTRATIVE DIVISION, 1978

District	Administrative Division	Number of Hospitals	Number of Rural Health Centers	Number of Dispensaries	Weighted Health Service Factor
Singida Rural					
	Ihanja	–	–	4	1/6149
	Ikungi	–	1	6	1/2658
	Mungaa	1	–	5	1/1201
	Mtinko	–	–	3	1/1938
	Mgori	–	1	3	1/2762
	Ilongero	–	1	6	1/4918
	Total	1	3	27	1/3143
Singida Urban		1	1	2	1/2430
Iramba					
	Kirumi	–	1	6	1/2903
	Nduguti	1	–	3	1/2275
	Kinyangiri	–	–	3	1/9048
	Kmampanda	–	–	2	1/14,838
	Kisiriri	1	–	4	1/1823
	Ndago	–	1	5	1/3769
	Shelui	–	1	4	1/3987
	Total	2	3	27	1/3270
Manyoni					
	Manyoni	1	1	3	1/668
	Itigi	–	1	4	1/2238
	Manyoni Vijijini	–	–	3	1/6607
	Kintinku	–	1	4	1/2304
	Nkonko	1	1	4	1/1499
	Total	2	4	18	1/1552
Total		6	11	74	1/2658

Source: 1978 Health Facilities Inventory, Tanzania Ministry of Health, 1980

TABLE IV-16

KILIMANJARO REGIONAL HEALTH FACILITIES BY DISTRICT AND ADMINISTRATIVE DIVISION, 1978[1/]

District	Administrative Division	Number of Hospitals	Number of Rural Health Centers	Number of Dispensaries	Weighted Health Service Factor
Same					
	Same	1	-	2	1/838
	Mwembe Mbaga	-	-	10	1/2643
	Gonja	1	-	3	1/4450
	Chome/Suji	-	1	8	1/1809
	Mamba Vunta	-	-	7	1/3388
	Ndungu	-	1	4	1/3020
	Total	2	2	34	1/2192
Mwanga					
	Ugweno	-	1	6	1/2276
	Usangi	1	-	1	1/1177
	Mwanga	-	-	5	1/2748
	Lembeni	-	-	5	1/2969
	Total	1	1	17	1/1937
Total		3	3	51	1/2095

1/ Same and Mwanga districts of Kilimanjaro region.

Source: 1978 Health Facilities Inventory, Tanzania Ministry of Health, 1980.

follows: Hospitals were weighted as 10 units, Rural Health Centers as 5 units, and dispensaries as 1 unit. This consistent basis provided a way to compare health services at the division level in the prioritization of needed road improvements. High district ratios indicate relatively lower health service than lower district ratios.

2. Endemic Diseases and Other Health Problems

During the interviews with the district functional health officers, it became clear the types of diseases are for the most part uniform among the study regions.

Although there are numerous exotic tropical diseases in Tanzania, such as malaria, bilharsia, leprosy, sleeping sickness, and river blindness, the major killers are measles, pneumonia, tetanus, and malnutrition. Most of these derive from poor sanitation, contaminated water, and a general lack of personal health maintenance knowledge and prevention programs. The major health problems are associated with the availability of health facilities, personnel, coordinated programs, and lines of communication. The lines of communication requirements include 1) notification of disease outbreak, 2) notification of rabid animals and incidence of dog bites, 3) delivery of health supplies, 4) movement of seriously ill patients to major health care centers, and 5) doctor accessibility to villages. These requirements include two elements--the availability of reliable vehicles, and the availability of all-weather reliable roads.

It should be noted that the interview responses produced approximately equal pleas for improved roads and vehicles. During the course of the interviews attention focused on the road problems and the relationship between vehicle breakdown rates and maintenance costs and the unacceptable condition of the roads.

3. Objectives of the Health Program

The following national health objectives have been excerpted from the Third Five Year Plan:[1/]

a. To increase the number of dispensaries and health services so as to achieve the nationally targeted ratio of one dispensary to 8,000 people and one health center to 50,000 people by 1980/81.

1/ Third Five Year Plan for Economic and Social Development, United Republic of Tanzania, Vol. 1, 1976.

b. To increase the number of hospital beds so that by 1980 we have one bed to 1,000 people in each district hospital, in addition to increasing residential houses for doctors and nurses especially in those areas where this target was not attained during the Second Five Year Plan period.

c. To stress Preventive Services against diseases in rural areas, rather than curative services.

d. To have a medical staff and a first-aid kit in each village where there are no medical facilities such as dispensaries.

e. To provide health services in the regions in accordance with the requirements of each region, the prevailing environment, and not only in accordance with the population.

f. To reduce the death rate among children under five years of age by implementing the following objectives:

--To intensify vaccination facilities so that 90 per cent of all children are vaccinated.

--To have Mother and Child Health Clinics at all the hospitals, health centers and dispensaries. The important services to be offered by these clinics will include examination of expectant mothers, child spacing and guidance on nutrition. In respect of clinical attention to expectant mothers, the objective will be to require each expectant mother to attend a clinic at least once before she delivers.

--To fortify the programs aimed at combating contagious diseases such as malaria, TB, leprosy, sleeping sickness, and bilharsia, and to integrate those programs with other normal health services in order to reduce deaths and terrible suffering which are caused by diseases not only in children but in adults.

--To increase Mobile Health Services from hospitals, health centers and dispensaries in order to reach the people who are far away from those facilities. In providing these services, the use of bicycles will be stressed.

--To decrease malnutrition by 30-50 per cent in each region by 1980/81, by having a nutritionist in each region by 1980/81. He or she can provide guidance in nutrition programs.

g. To start school health services and to consolidate them where they already exist, in cooperation with the Ministry of National Education.

h. To restress the importance of the campaign urging people to eat balanced diets, "Chakula Bora," and the importance of environmental cleanliness requiring each household to have a latrine and use it.

In support of these health objectives, the Third Five Year Plan includes T/shs 256.1 million of development funds on a national basis. This represents 11.5 per cent of the total T/shs 2,225.8 million program. On a regional basis, Dodoma, Singida, and Kilimanjaro include T/shs 13.1, 8.9, and 14.7 million, respectively. The health sector share of the national operating budget has increased markedly over the last decade. The government budget has grown at 6.5 per cent annually with heavy emphasis on preventive services. Most recently the government has concentrated on the building and staffing of rural health services.

4. Progress in Meeting the Health Program Objectives

Although great strides have been made in health since 1976 (end of Second Five Year Plan), the health facility and service goals stipulated with respect to people per rural health center in the Third Five Year Plan will not be met by 1981. The target of 8,000 people per dispensary appears to be within reach. Discussions in the field indicate a definite commitment to upgrading dispensaries, expanding the number of dispensaries, and building Rural Health Centers. The role of efficient and reliable transportation--especially roads--was cited throughout the field surveys as a necessary ingredient in reaching the national health program objective.

5. Impact of Improved Rural Access Roads

The projection of the potential impacts of improved roads on the provision of health services is based on interviews with administrators of health services. There is general consensus that monitoring of health conditions, delivery of needed supplies, and provision of health specialists from the central service center (district hospital) suffer directly from the poor quality of existing rural roads. Interviews cited many specific cases supporting the conclusion that the quality of existing services and the prospects for continued improvements in the health of the village populations is directly linked to the accessibility of trained medical personnel and supplies in a timely manner and on an all-season basis.

C. Education

A review of existing educational facilities, in terms of location and other fundamental statistics, was conducted as part of the field work

to identify the relationship between the national commitments to education and the existing system of rural roads. The primary emphasis was placed on securing the qualitative views of each district functional manager for education on: (1) the transportation problems which exist today; (2) the magnitude of the line-of-communication problems; and (3) the impact of improved roads on the education system. These local perceptions of the transport problems focused on the availability of vehicles and the condition of the roads. As with health, the interviews were conducted to emphasize road conditions and the relationship between vehicle life and maintenance costs and the inadequacy of the roads. These field interviews were augmented through contacts with the Ministry of Education to calibrate and supplement the statistics available in the field. The field interview results, in terms of transport problems and the relationship of road conditions to national educational goals and objectives, were reviewed with the Ministry of Education specialist. These linkages, although qualitative, may be classified as 1) transport of supplies and materials, 2) monitoring of educational facilities and services, 3) teacher access to monthly remuneration, and 4) transport of material for building classrooms and teachers' housing

1. Facilities and Enrollment

A summary of primary education statistics is presented as Table IV-17 for 1) the study regions, 2) the total study area, and 3) the nation as a whole. Emphasis was placed on primary education since secondary education represents less than 1) 1.5 per cent of total enrollments, 2) 3.1 per cent of the teachers, and 3) 2.4 per cent of the schools for the study regions.

Several comments are in order with respect to the summary table:

a. Per Cent School Age Enrollments--The regional totals compare favorably with the World Bank 1976 estimate of 70 per cent school age enrollment, and reflect the impacts of the Universal Primary Education (UPE) Act of 1976. The UPE stipulates that the attendance in primary schools by all school age children is mandatory. It should also be noted that the school age enrollments in the Kilimanjaro districts reflect the fact that a significant number of students from other areas attend school in this "high-quality" educational area.

TABLE IV-17
PRIMARY EDUCATION SUMMARY BY DISTRICT, 1978

Region	District	Population	Student Enrollment	Per Cent School Age Enrollment	Number of Schools	Number of Teachers	Student/ Teacher Ratio	Per Cent of Teachers with Housing
Dodoma								
	Dodoma Rural	276,737	47,667	81.5	113	1,081	44/1	25
	Dodoma Urban	158,577	26,188	82.1	52	678	39/1	30
	Mpwapwa	261,525	49,441	84.8	128	967	51/1	20
	Kondoa	275,082	52,523	81.0	158	1,157	45/1	15
	Total	971,921	175,819	82.3	451	3,883	45/1	25
Singida								
	Singida Rural	213,732	37,432	77.9	78	1,015	37/1	20
	Singida Urban	55,892	8,932	78.5	20	258	35/1	25
	Iramba	242,003	42,504	79.5	115	911	43/1	20
	Manyoni	102,403	14,934	75.8	63	511	39/1	30
	Total	614,030	103,802	77.9	276	2,775	37/1	25
Kilimanjaro								
	Same	133,725	36,161	108.7	117	643	56/1	10
	Mwanga	73,630	21,784	113.6	68	375	58/1	10
	Total	207,355	57,945	110.1	185	1,018	57/1	10
Total Study Area		1,793,306	337,566	84.5	912	7,676	44/1	25
Total Tanzania		17,527,564	2,993,371	78.0	9,923	63,740	47/1	-

Source: Ministry of Education (unpublished data).

b. Student/Teacher Ratio--This statistic was included as an indicator of the comparative quality of education because one of the national objectives is to reduce the ratio to below the 45/1 level which existed in 1976. It should be noted that although on a regional basis the objective had been reached by 1978 at the administrative division level, disparities between national goals and 1978 existing ratios are evident. This phenomenon indicates the need for more teachers and consequently more teachers' housing. The student/teacher ratio was used as the indicator to comparatively differentiate among the administrative divisions in the road system evaluation and prioritization scheme.

c. Per Cent Teachers with Housing--This estimate, which was produced from interviews with the functional managers, is included to indicate the magnitude of the teacher housing problem.

The educational statistics at the administrative division basis are presented in Tables IV-18 through IV-22. These statistics were employed as a backdrop for comparative evaluation of the social aspects and impacts of improving the rural roads.

The administrative division educational statistics were calibrated in conjunction with the Ministry of Education against regional and district statistics since local statistics are collected and reported by educational zones which are not consistent with administrative boundaries. Through discussions with the Ministry of Education the consultants' recommendation to collect data at the administrative division level will be added to their current efforts to assemble reasonable and reliable educational statistics for planning purposes. This current program to improve the educational statistical base has been highlighted by 1) the historical inconsistencies in census data and Ministry of Education data, 2) the implications of the increased pupil enrollments on teachers' requirements, housing and budgets through 1990, and 3) the national commitment to extend educational opportunities at the community level through expanded adult education and community education at the village school facility.

2. Educational Status

There have been significant strides in primary education since

TABLE IV-18
DODOMA REGION PRIMARY SCHOOL STATISTICS BY ADMINISTRATIVE DIVISION, 1978

District	Administrative Division	Total Enrollment	Number of Boys	Number of Girls	Number of Teachers	Number of Schools	Student/ Teacher Ratio
Dodoma Rural							
	Itiso	5,095	2,751	2,344	128	11	48/1
	Chamwino	6,555	3,540	3,015	136	13	48/1
	Mvumi	6,937	3,746	3,191	154	12	45/1
	Mwitikira	6,236	3,367	2,869	145	13	43/1
	Chipanga	5,501	2,971	2,530	127	15	43/1
	Bahi	6,078	3,282	2,796	140	14	43/1
	Makangwa	4,913	2,653	2,260	99	13	50/1
	Mundemu	6,352	3,430	2,922	152	17	42/1
	Subtotal	47,667	25,740	21,927	1,081	113	44/1
Dodoma Urban							
	Hombolo	5,541	2,992	2,549	138	18	40/1
	Kikombo	4,048	2,186	1,862	91	6	44/1
	Nala	3,684	1,989	1,695	99	6	37/1
	Mpunguzi	2,587	1,398	1,189	71	6	36/1
	Urban Center	10,328	5,577	4,751	279	16	37/1
	Subtotal	26,188	4,142	12,046	678	52	39/1

Source: District Education Officers and Ministry of Education, Planning Office, Dar Es Salaam.

TABLE IV-19
DODOMA REGION PRIMARY SCHOOL STATISTICS BY ADMINISTRATIVE DIVISION, 1978

District	Administrative Division	Total Enrollment	Number of Boys	Number of Girls	Number of Teachers	Number of Schools	Student/ Teacher Ratio
Mpwapwa							
	Mpwapwa	12,319	6,650	5,669	262	28	47/1
	Kibakwe	6,751	3,647	3,104	123	19	55/1
	Mlali	9,502	5,131	4,371	196	24	49/1
	Zoissa	6,258	3,379	2,879	122	20	51/1
	Kongwa	7,297	3,941	3,356	133	23	55/1
	Rudi	7,314	3,950	3,364	131	14	56/1
	Subtotal	49,441	26,698	22,743	967	128	51/1
Kondoa							
	Kondoa	6,017	3,249	2,768	142	11	42/1
	Mondo	8,988	4,854	4,134	188	20	48/1
	Farkwa	2,802	1,510	1,292	62	13	45/1
	Kwamtoro	4,964	2,681	2,283	99	23	50/1
	Pahi	9,777	5,279	4,498	235	28	42/1
	Goima	5,338	2,882	2,456	107	23	50/1
	Bereko	8,537	4,609	3,928	198	24	43/1
	Kolo	6,100	3,294	2,806	136	16	45/1
	Subtotal	52,523	28,358	24,165	1,157	158	45/1
Total		175,819	95,173	80,646	3,883	451	45/1

Source: District Education Officers and Ministry of Education, Planning Office, Dar Es Salaam.

TABLE IV-20

SINGIDA REGION PRIMARY SCHOOL STATISTICS BY ADMINISTRATIVE DIVISION, 1978

District	Administrative Division	Total Enrollment	Number of Boys	Number of Girls	Number of Teachers	Number of Schools	Student/ Teacher Ratio
Singida Rural							
	Ihanja	4,308	2,305	2,003	112	10	38/1
	Ikungi	5,123	2,741	2,382	129	12	40/1
	Mungaa	4,419	2,364	2,055	118	9	37/1
	Mtinko	10,183	5,448	4,735	285	21	36/1
	Mgori	3,861	2,066	1,795	114	9	34/1
	Ilongero	9,538	5,103	4,435	257	17	37/1
	Subtotal	37,432	20,027	17,405	1,015	78	37/1
Singida Urban		8,932	4,779	4,153	258	20	35/1
Iramba							
	Kirumi	5,607	3,016	2,591	130	15	43/1
	Nduguti	7,591	4,084	3,507	166	20	46/1
	Kinyangiri	4,768	2,565	2,203	101	11	46/1
	Kinampanda	5,213	2,805	2,408	135	14	43/1
	Kisiriri	6,403	3,445	2,958	159	18	42/1
	Ndago	6,619	3,561	3,058	148	17	44/1
	Shelui	6,303	3,393	2,910	162	20	41/1
	Subtotal	42,504	22,869	19,635	991	115	43/1

Source: District Education Officers and Ministry of Education, Planning Office, Dar Es Salaam.

TABLE IV-21

SINGIDA REGION PRIMARY SCHOOL STATISTICS BY ADMINISTRATIVE DIVISION, 1978

District	Administrative Division	Total Enrollment	Number of Boys	Number of Girls	Number of Teachers	Number of Schools	Student/ Teacher Ratio
Manyoni							
	Manyoni	2,240	1,198	1,042	87	30	34/1
	Itigi	2,611	1,396	1,215	109	32	36/1
	Manyoni Vijijini	1,927	1,031	896	64	40	40/1
	Kintinko	2,688	1,438	1,250	83	43	43/1
	Nkonko	5,468	2,926	2,542	138	46	46/1
	Subtotal	14,934	7,989	6,945	511	63	39/1
Total		103,802	55,549	48,253	2,775	276	37/1

Source: District Education Officers and Ministry of Education, Planning Office, Dar Es Salaam.

TABLE IV-22

KILIMANJARO REGION PRIMARY SCHOOL STATISTICS BY ADMINISTRATIVE DIVISION, 1978[1/]

District	Administrative Division	Total Enrollment	Number of Boys	Number of Girls	Number of Teachers	Number of Schools	Teacher/ Student Ratio
Same							
	Same	5,895	3,030	2,865	105	7	56/1
	Mwembe Mbaga	5,744	2,952	2,792	101	25	57/1
	Gonja	4,544	2,336	2,208	82	19	55/1
	Chome/Suji	6,987	3,591	3,396	132	21	53/1
	Mamba Vunta	6,054	3,111	2,943	109	23	56/1
	Ndungu	6,937	3,554	3,383	116	22	60/1
	Subtotal	36,161	18,574	17,587	643	117	56/1
Mwanga							
	Ugweno	7,381	3,669	3,712	131	19	56/1
	Usangi	5,787	2,922	2,865	101	22	57/1
	Mwanga	3,608	1,729	1,879	62	13	58/1
	Lembeni	5,008	2,528	2,480	81	14	62/1
	Subtotal	21,784	10,848	10,936	375	68	58/1
Total		57,945	29,422	28,573	1,018	185	57/1

1/ Same and Mwanga Districts of Kilimanjaro region.

Source: District Education Officers and Ministry of Education, Planning Office, Dar Es Salaam.

the implementation of the Musoma Resolution on Universal Primary Education. Enrollments between 1976 and 1978 increased by 43, 29, and 42 per cent for the Dodoma, Singida, and Kilimanjaro regions, respectively. The number of schools increased by 8, 9, and 11 per cent in Dodoma, Singida, and Kilimanjaro regions, respectively. On a national basis the total national enrollments have increased by over 53 per cent since 1976.

The study region includes a comparatively insignificant number of public and private secondary schools. The Dodoma region contains 9 secondary schools, with 3,157 students and 186 teachers. Singida has 9 secondary schools with 1,101 students and 54 teachers. There are approximately 2,000 students in four secondary schools in the Same and Mwanga districts of the Kilimanjaro region.

3. Objectives of the Education Program

The following objectives for education in Tanzania have been excerpted from the Five Year Plan:[1/]

a. The first target is to implement the 1974 Musoma Resolution requiring that each child of school age go to school by November 1977--Universal Primary Education (UPE). In the Third Five Year Plan, the national target is to have all school age children admitted to Standard One. More efforts will be made in building more classrooms and teachers' houses in order to increase the nation's capacity to achieve the target.

b. The second target is to insist on regular primary school attendance.

c. The third target is to develop primary school education on the basis of "Ujamaa and self-reliance." Education for self-reliance is intended to enable pupils to rely on themselves in such activities as handicrafts and farming.

d. The fourth target is to increase the teacher/pupil ratio. Up to the end of the Second Five Year Plan the ratio was one teacher to 43 pupils. Efforts will be made to increase the number of teachers. Also in order to alleviate the current problem of housing, the building of teachers' quarters will be emphasized.

e. The fifth target is to emphasize primary school education and to make use of materials readily available locally.

1/ Third Five Year Plan for Economic and Social Development, United Republic of Tanzania, Vol. 1, 1976.

f. The sixth target is to make sure that classes are arranged in accordance with the number of children in different villages. The responsibility of building primary schools with the villagers and the government will only supplement the villagers' efforts.

g. In order to implement the target of UPE, it is estimated that T/shs 418.2 million will be spent during the Third Five Year Plan period (1976-1981).

4. Progress in Meeting the Educational Program Objectives

It can be observed by the 53 per cent increase in the national enrollments and 76 per cent increase in the number of schools between 1976 and 1978 that the impacts of UPE have been extremely significant.

A comparison of increases in pupil enrollments and number of schools by region is provided below in Table IV-23.

TABLE IV-23
ADVANCES IN REGIONAL EDUCATION (1973-1978)

	1973 Enroll-ments	1978 Enroll-ments	Per Cent Increase	1973 Schools	1978 Schools	Per Cent Increase
Dodoma	61,510	175,819	185	294	473	60
Singida	50,573	103,802	105	270	308	14
Kilimanjaro	101,986	211,355	107	425	666	56
Tanzania	1,105,806	2,993,371	170	5,178	9,923	91

At the administrative division basis much work will be required to reduce the student/teacher ratio, through training, hiring, and maintaining teachers, and building teachers' housing at the school. The prospects of expanding adult education programs and the concept of Community Education Centers are directly related to the local population perception of the school. This perception and community support is in turn related to on-site location of the teachers at the educational facility.

5. Impact of Improved Rural Access Roads

Although it is difficult to predict the quantitative impact of improved roads without systematic before-and-after data, it is clear from the numerous interviews and consultant observations that local social benefits will be realized from rural road improvements. These

benefits will include: (1) Facilitation of delivery of educational supplies which are at present not delivered on a timely and reliable basis; (2) Facilitation of transport of needed building supplies for classrooms and teachers' housing construction (this is a critical problem in education throughout all study areas); (3) Improvement of the attractiveness of the teaching profession by providing needed lines of communication to social opportunities, professional discussion and workshop opportunities, and collection of pay checks (at present some teachers have to travel many days each month to receive monthly pay checks); and (4) Providing opportunities for district and zonal administrators to visit and monitor the progress in education at the remote schools (current road conditions preclude this needed element of teacher and school support on a reliable and consistent basis).

D. Rural Water Supplies

Water is one of the essential necessities for human life. It is one of the measures of national development and critical for domestic purposes, agricultural and industrial activities.

Up to June 1974, 3.4 million villagers in Tanzania had been connected to safe water supplies, representing 17 per cent of the population compared to only 1.4 million in June 1971.

A total of 37,354 million liters of water were consumed in 1973/74 compared to 26,000 million liters in 1968/69, reflecting an increase of 11 per cent. Higher rates in water consumption have been observed in Dar es Salaam, Tanga, Arusha, and Mwanza due to increased urban population and a concentration of industries in these towns.

The rise in oil prices and industrial goods all over the world increased the cost of water supply projects. This trend resulted in a general shortage of water pumps, water pipes, and vehicles, consequently reducing the implementation rate for earmarked projects. To solve this problem the government created a special Revolving Fund of T/shs 40 million for the procurement of water supply equipment.

Tanzania's plateau formation and geological structure limit the potentials for low-cost shallow wells prevalent in South and East Asia. Deep bore-holes and surface reservoirs are an extremely costly but necessary alternative. A detailed study by the World Bank of technological

alternatives for increasing the rural water supply in Tanzania to full coverage would cost between T/shs 2.5 to T/shs 3.7 billion in 1976 prices.[1/] An expenditure of this magnitude would require outlays from three to five times the share allocated under the Third Five Year Plan. Due to the massive capital requirements and required manpower and organizational skill, the goal of universal rural water supply by 1980 has been postponed from 1980 to 1991.

The objective of this section is to present the results of the overview analysis of the study regions' rural water supplies with respect to 1) existing facilities, 2) the status of existing service, 3) objectives of rural water supply programs, 4) progress in meeting objectives, and 5) the potential impacts of improved rural access roads.

1. Facilities

Rural water supply system information was collected on two bases-quantitative data on existing facilities, and qualitative comment on the transportation problems associated with providing village water. Information was collected through field interviews with district water engineers, and through reference to the Dodoma Water Master Plan, the Singida Water Master Plan, and the Kilimanjaro Water Master Plan. It should be noted that there are numerous technical data, information and analysis included within the master plans with respect to the quality of available water supplies and plans for future development. For the purposes of this study data collection and reduction were directed to statistics on the general adequacy of the supplies of water as opposed to the many issues associated with needs for water purification, water system maintenance, and water district organization.

There are wide ranges in the types of water systems, dispersion of resources (water sites), efficiency of systems and potentials for development among the nine districts included within the study regions. The following subsections present a summary description of the types of systems which presently exist. A discussion of the relative water supply system employed in the comparative evaluation at the administrative division level is presented in the following section.

Dodoma Region[2/]

1/ The World Bank, Two Studies of Development in Sub-Saharan Africa, Working Paper 309, October 1978, p. 52.

2/ Water Master Plan Dodoma Region, Tanzania Water Master Plan Team, Water Quality Technical Annexure C, 1977.

--Of the total of 162 water schemes in operation in the region, 94 are classified as suitable and 68 as unsuitable.

--The types of water sources in the region include boreholes, waterholes, springs, dams and rivers.

--The Dodoma district has 48 boreholes, 11 waterholes, and 3 dams. Twenty-seven of the boreholes are considered unsuitable, and 4 of the waterholes are classified as unsuitable.

--The Kondoa district has 53 water systems--30 boreholes, 9 waterholes, 13 springs and 1 dam. Of the 30 boreholes, 9 are classified as unsuitable. With respect to waterholes and springs, 6 waterholes and 6 of the springs are unsuitable. The dam water is considered unsuitable.

--The Mwapwa district has 47 water systems--34 boreholes, 6 waterholes, 4 springs and 3 rivers. Sixteen of the boreholes and 2 of the waterholes are considered unsuitable.

Singida Region[1/]

--There are a total of 307 village water supply systems in the Singida region. Of these, 156 systems are considered to have serious problems. The types of problems include: pollution/contamination, quantity of water, and distance to supply by villages (over 6 km. round trip considered as a problem). A breakdown of the sources of village water supplies for the region is presented in the tabulation and summarized below.

--Of the 139 water supply systems in the Singida district (rural and urban), approximately 70 per cent are considered inadequate in terms of pollution levels, quantities and distance to source.

--The Iramba district has 105 supply systems. Of this total, 45 or 42 per cent of the systems are considered inadequate.

--In the Manyoni district 24 of the 63 water supply systems are considered inadequate.

Kilimanjaro Region-Same/Mwanga Districts[2/]

1/ Water Master Plan Singida Region, Australian Development Assistance Bureau, Government of Australia, Summary Report, 1978.
2/ Water Master Plan Kilimanjaro Region, Final Report, Japan International Cooperation Agency, Vol. VII, 1977.

SINGIDA REGION
SOURCES OF VILLAGE WATER SUPPLY

Type of Supply	Whole Region No.	%	Iramba No.	%	Singida No.	%	Manyoni No.	%
Shallow wells	119	39	39	37	62	44	18	29
Boreholes	71	23	19	18	24	17	20	44
Wells in rivers	52	17	31	29	12	9	9	14
Springs	24	8	4	4	16	12	4	6
Lined wells	22	7	3	3	16	12	3	5
Dams	15	5	6	6	9	6	-	-
Flowing rivers	3	1	3	3	-	-	-	-
Swamps	1	-	-	-	-	-	1	2

--There are 158 water systems providing service to the district's population. This does not include furrow systems which are used for irrigation. These systems were excluded from the analysis because of contamination by livestock.

--Of the total number of operating systems, 17 are classified as surface water sources, 13 are boreholes, and 128 are springs.

--The Ugweno and Usangi administrative divisions in the Mwanga district have adequate water supplies based on the quantity of water. The systems in the Mwanga and Lembeni administrative divisions provide 69 and 38 per cent of the current water requirements respectively.

--Water system adequacy in the Same district ranges from a low of 33 per cent of the daily requirements in Mamba Vunta to a high of 99 per cent in the Chome/Suji division.

2. Status of Service

Reviews of the three regional Water Master Plans indicated that each plan process approached the issue of ranking village water systems, in terms of adequacy or suitability, in differing fashions. The Water Master Plan Dodoma employed a rather complex weighting system for each system, while the Singida Plan employed a six-factor binary system inventory format, and the Kilimanjaro Plan focused on daily quantities of water (cubic meters) per system

A relative water supply index was developed to provide a backdrop for uniform comparative evaluation of rural water supply by administrative division. The index was subsequently employed as one of the

social factors in the road improvement potentials evaluation.

The ranking system was developed on a five-point basis: Good = 1; Above Average = 2; Average = 3; Below Average = 4; and Poor = 5. The results of these rankings show that in the Dodoma region 2 out of 26 administrative divisions are considered to have "good" water supply systems, while 11 are considered "above average," 8 are considered "average," and 5 are classified as "poor." In the 18 divisions in the Singida region, 4 are ranked as "good," 4 as "above average," 4 as "average," and 3 as "poor." Of the 10 administrative divisions in the Same and Mwanga districts of the Kilimanjaro region, 5 are considered as "good," 2 as "average," and 3 as "poor." The details of the methods of calculating the water supply index and companion tables are presented in the Appendix, Tables A-IV-21 through A-IV-23.

3. Objectives of the Water Supply Program

The Third Five Year Plan objectives include:[1/]

--To reemphasize the need to provide clean water to a majority of the rural population by implementing projects which do not require large financial outlays and great expertise, and which are implemented by the people themselves.

--To implement various techniques in providing water, including hand pumps and windmills.

--To expand water services to provide a source of clean water for each village so that by 1991 clean water will be provided to 100 per cent of the rural population.

--To provide clean water to villages does not mean providing piped water. The first priority is to provide water in places where there is none. The strategy will be to drill wells, and where possible, to dig trenches from the water source to residential areas.

--To provide water for the livestock and for irrigation through water catchment dams, and training programs for water technicians at the village level.

--The objective to supply water in rural areas is to increase the number of urban dwellers who are supplied with water from 68 per cent in 1976 to 82 per cent in 1981.

--During the Third Five Year Plan, it is estimated that T/shs 362.4 million will be spent on water projects.

1/ Third Five Year Plan for Economic and Social Development, United Republic of Tanzania, Vol. 1, 1976.

The main objective of the Third Five Year Development Plan is to provide the rural population with adequate clean water supplies by 1991. In trying to achieve this important goal, efforts have been made to identify and wherever possible provide clean water to every village. Achieving the given long-term target necessarily means that an average of 1.5 million people should be supplied with water every year. Plans have also been prepared to supply water for industrial purposes.

4. Progress in Meeting Water Supply Program Objectives

Under the Second Five Year Plan, output targets concerning rural water supply were not detailed. It was mentioned in general that water supply in villages would be undertaken. The specific targets set in September 1974 by the Party's National Executive Committee stated as follows: "with immediate effect the essential needs in respect of water, education and health must be given top priority in our financial commitments."

In accordance with the Party's directive, the Ministry of Water, Minerals and Energy prepared a 20-year long-term plan whose target was to supply water in rural areas so that by 1991 each village gets a source of sufficient and clean water.

Up to the end of 1971, 11.9 per cent of all Tanzanians had access to clean water. In order to achieve the national objective of supplying a source of clean water to villages by 1991, it will be necessary to supply sources of clean water to 1,100,000 people per year. Table IV-24 shows the percentage of people who were supplied with water, in each region, by June 1975. It is interesting to note that Dodoma led all regions for the rural areas, with 62 per cent. It was followed by Kilimanjaro with 40 per cent.

As indicated by the statistics, about eight regions have not reached the national average (23 per cent) in water supply. Only five regions provide clean water to more than 30 per cent of their people. On the average, nearly 68 per cent of the people living in urban areas are supplied with clean water and nearly eight urban centers provide clean water to more than 70 per cent of their dwellers.

The problem that confronted implementation of the set targets included shortages of sufficient technicians to advise on technical

TABLE IV-24
WATER SUPPLY BY REGION
PEOPLE SUPPLIED WITH CLEAN WATER AS
PERCENTAGE OF TOTAL REGIONAL POPULATION -- 1975

Region	Rural Areas	Urban Areas
Arusha	33	95
Dar Es Salaam	-	-
Dodoma	62	80
Iringa	-	-
Kigoma	18	75
Kilimanjaro	40	74
Lindi	35	80
Mara	22	100
Mbeya	10	36
Morogoro	17	80
Mtwara	10	40
Mwanza	13	45
Pwani	-	-
Rukwa	15	40
Ruvuma	19	-
Shinyanga	7	84
Singida	35	60
Tabora	18	-
Tanga	15	72
West Lake	35	80

aspects especially at the district level. The second problem was lack of water pipes and pumps. Since the decentralization was launched, the implementation of water programs has yielded substantial results, especially in respect to trench digging and pipe laying through self-help schemes.

Water is of primary importance in the transmission of such diseases as cholera, typhoid fever and infectious hepatitis. An outbreak of cholera occurred in two of the three study regions (Dodoma and Singida) in March 1980. Its cause was attributed to contaminated water.

Programs for constructing dams, shallow and deep wells, are being prepared and implemented. These projects are usually less costly--shallow wells for instance cost approximately T/shs 50 per person compared to T/shs 200 per person for piped water schemes. With the general scarcity of financial resources, preference is given to the construction of shallow wells wherever possible. Projects that require large amounts of money are given second priority. In some

places it is easier to dam small rivers, while in others gravitational methods or piping water from dams and lakes are used.

To speed up implementation of water supply programs, beneficiaries are required to participate fully, particularly on small projects. Village governments are expected to investigate the best method of meeting part of the water supply costs for their water schemes. Funds allocated for village water programs are used for supplying water to other villages where there are no water supplies.

Some of the important studies related to its national water projects include the Rural Water Supply Program at Kilimanjaro, and continued implementation of the Singida and Dodoma Water Master Plans.

5. Impact of Improved Rural Access Roads

The provision of clean drinking water within a village has a significant impact on raising the quality of life within the village. The national goal for universal rural water supply by the new target date of 1991 depends on the expansion of new systems and the maintenance of the systems currently in place. From a planning standpoint, the role of improved access to new village water projects is well appreciated as a significant element in the timely construction of various water schemes. Improved rural roads will facilitate on-site surveys and master plan development, technical studies and research, and system construction.

The field interviews produced a more significant observation than concerns about future installations--namely concern about the continued operation of existing facilities.

At present there are a number of transport problems which are exerting serious pressures on the existing rural water supply systems. These transport problems, identified by the district water engineers and district material officer, include the timely and reliable transport of diesel fuel for pump operations, necessary spare parts, and lines of communication with respect to system failures.

Recurrent comments with respect to impact of the condition of the existing rural roads on vehicle maintenance and extensive periods of breakdown were made in all the study districts. A general consensus exists that the preservation of the currently operating rural water systems is directly linked to the accessibility of district water

engineering technicians to the water system sites--especially diesel water pumps at boreholes.

E. Other Social Aspects

1. Villagization and Social Impact Upon the Rural Access Road Program

Tanzania's program of villagization undertaken during the 1970s resulted in the radical demographic shift of many rural populations from dispersed rural settlements (hamlets near farms and/or herding areas) to compact, although typically small villages. The villagization program greatly affected most of the peoples of Dodoma and Singida regions, and had less effect on the demography of Same/Mwanga in Kilimanjaro, where the population was already heavily concentrated in the highlands and other fertile areas of the Pare Mountains and surrounding plains. It is now the case that the vast majority of people in Dodoma, Singida, and Same/Mwanga live either in villages or within close proximity to other people. Remote, dispersed settlements formerly typical of some parts of these areas are uncommon today. The consequences of this demographic change for community life and social services and its impact upon the proposed rural access road program are significant and are discussed in the following paragraphs. Unless otherwise noted, these remarks apply to the areas of specific concern (Dodoma and Singida, and the Same/Mwanga districts of Kilimanjaro). They may or may not apply to the remainder of Tanzania.

a. Educational opportunities

National policies of villagization and universal primary education mean that virtually no school-age child is unable to attend grades 1-4 due to availability of schools or too great a distance from home to school. Every village visited by the social anthropologist had at least one primary school with one or more permanent teachers. Since children live with their parents in villages near the schools, the distance from home to school is not great. Many villagers estimated that children need walk only a few minutes to school each day. In those cases where it was reported that children must walk "very far" to school, this distance was reported to be slightly more than one hour in each direction. However, it should be noted that villagization, and hence compact settlement of populations, has meant that such

distances from home to school as this are rare nowadays. This stands in marked contrast to the situation of ten years ago when many children lived too far from schools to attend regularly. The Pare Mountains contain many primary schools, and although compact villages do not exist as in Singida and Dodoma regions, children similarly live close to educational facilities. In addition to children, the close proximity of the population to the schools has a direct benefit to adults as well as children. School buildings or other community center facilities are used for adult education classes. They are frequently taught by the local school teachers as well as other resident experts (agricultural and livestock agents, medical personnel, party officials, etc.). Just as the children are not remote from the school facilities, adults also now live close enough that attendance at the extension programs is not a problem due to distance. It is also the case that the local experts who give adult education courses are readily available since they live near the educational facilities. Thus, villagization has meant that the population must move relatively short distances for either primary or adult education. Improved roads would not so much facilitate the access of the population to schools as it would provide a certain and steady means of linking the local primary schools and adult education facilities with their supply centers. The problems of obtaining supplies and of transporting experts into and out of the villages were cited by villagers as the most serious problems concerning the relation of roads with educational facilities. It is unlikely that attendance rates would be directly affected by improved all-weather access roads, but it is almost certain that improved roads would be directly related to higher quality in education for both children and adults.

b. Health

When asked what improved all-weather roads would mean for their lives, the first and most frequent responses of villagers concerned ease of access to health facilities and of personal transportation when healthy. Although many villages have local dispensaries, it is often the case that sick persons must be

transported considerable distances to obtain adequate medical care. In some instances, this means that others must carry the sick person (usually in a chair constructed for this purpose) several kilometers. Often this is only the first stage of a trip which will also involve the use of public transportation (usually buses) to reach government or private hospitals. In many cases, villagers will hire private vehicles to transport sick relatives--often at great expense--to the nearest adequate medical facility. In addition to the savings which improved transportation facilities would mean for the health care of villagers, it should be noted that easier and more frequent access might result in the saving of lives where time is a critical factor. Moreover the current adverse road conditions and lack of transport facilities sometimes may make it too difficult for really sick persons to travel.

Improved all-weather roads would directly result in greater access throughout the year to medical facilities. In those areas where public transportation is currently unavailable, it is often due to the fact that the roads are in such poor condition that buses either cannot or do not pass through the villages on a regular basis. Improved roads would also make it possible to provide medical supplies on a regular basis to dispensaries, clinics, and hospitals located in remote areas of the regions. In addition, the medical personnel from the major hospitals who oversee the smaller clinics and dispensaries must now spend a good deal of effort in traveling from one place to another. Improved roads would reduce the travel time and thus allow more technical expertise of medical personnel to be used in providing medical care to larger numbers of people.

c. Community Development Activities

Roads and community development activities (rural water supplies, self-help school construction, etc.) are linked in an important way. With regard to manpower, national policy currently requires Tanzanian citizens to work three days per week (Mondays, Tuesdays and Wednesdays) in cooperative, self-help programs. Thus, labor is less a problem than is the lack of technical assistance and supplies for construction and maintenance of community

development projects. Some communal labor could be deployed easily in road maintenance. What villagers emphasized repeatedly in interviews as their greatest need was the assistance of experts to prepare roads and to offer help with serious maintenance matters. Routine maintenance could be easily incorporated in the communal labor efforts--as is now done on a smaller scale.

In addition, transportation difficulties for supplies, spare parts, and technical experts are currently so great in many communities that essential facilities do not receive routine maintenance and therefore many remain inoperative for several months at a time.

Improved access roads would greatly increase the likelihood of providing assistance and supplies for all sorts of community development projects more quickly and readily than is currently the case.

d. Provision of Essential Government Services

Tanzania's government and party structure extends from the national capital to every village. At the local level, there is a Village Chairman, a Village Secretary, a Party Secretary, and ten-house cell leaders. Thus, there is no absence of government or party structure in Tanzanian villages. In many cases as well, there are local agricultural and livestock extension agents. However, contact between these officials in the villages and their counterparts at the ward, district, and regional levels is often limited due to the lack of adequate transportation facilities. In the case of agriculture and livestock, improved access roads would facilitate production in at least two ways. First, needed supplies could be brought into the communities with greater ease--whether these be new varieties of seed, chemicals needed for livestock dips, or the limited chemical pesticides and fertilizers which are used. Secondly, supervisory agricultural, livestock, and other service agents could maintain closer contact with their own communities over which they are responsible. This should in turn result in better communication, improved guidance, and more accurate record keeping, which would ultimately be of great assistance in development planning and application.

Present transportation and communication difficulties stem

from both the inferior quality of many of the feeder roads linking villages with ward, district, and regional centers and the lack of either public transportation or government vehicles. In the case of Singida and Dodoma, many communities own cooperative buses and/or trucks; some have both private and cooperative vehicles available, while others lack any vehicles on a regular basis. In Same/Mwanga, most buses and other vehicles are privately owned. Thus, whether initiated by the government, party, extension agents, local community leaders, or citizens themselves, transportation difficulties stemming from inferior roads and the lack of sufficient numbers of vehicles mean that many villages do not maintain as much contact with ward, district, and region as is desirable. (See Appendix for a fuller discussion of the difficulties of government personnel and private citizens regarding mobility.)

e. Impact on Women and Other Special Groups Within the Population

Due to the fact that the Tanzanian economy is presently subsistence-oriented with the goal of sales of small amounts of surplus through marketing cooperatives, the impact of improved feeder roads is more likely to be diffused throughout the communities than to benefit many particular special interest groups. This would differ from other countries which for example might have a wealthy entrepreneurial class who are the middlemen in purchasing locally produced commodities for sale, or a class of persons who own the vehicles used for transportation within the country. This is especially true in many villages of Dodoma and Singida where there are no private shops, no privately owned vehicles, and no local entrepreneurs who would benefit differentially from improved transportation facilities.

With regard to women, improved roads can be expected to assist them through providing better adult education facilities, easier access to medical facilities, better and more widely available social services, and the like. In addition, the improvement of communication between local communities and administrative and supply centers might materially improve the lives of women through the improvement and better maintenance of such facilities as water supplies. In many instances, women now must transport water for

daily domestic use over relatively long distances. During the dry season, this work may increase substantially where there is not a dependable source of water for domestic use.

On the other hand, it should be pointed out that in the past most extension programs and social services have been either designed with men in mind or have sought men to explain the planned programs. Increasingly, Tanzania is taking cognizance of the needs of all its citizens. While there is considerable room for improvement of social services and benefits directed specifically to women, there is little reason to suspect that the proposed road improvement would entail any negative consequences for women or other special groups within the population and might well have some positive benefits.

General Statement about Historical Changes in Politics and Administration and Effects on Project

Changes in Tanzanian political and administrative structures since national independence have been radical and far reaching. Few, if any, institutions which were in place prior to the 1960s remain untouched by reform of the last two decades. Among the most important changes which have direct bearing on the proposed program are development, ujamaa (both in its ujamaa vijiji vya ujamaa forms, to be explained shortly), and villagization. Most changes are in one way or another a direct result of these major reforms in Tanzania.

Development (or maendeleo in Swahili) is a household word in Tanzania, but it has only been one since the mid-1960s. Few, if any, Tanzanians in even remote parts of the country have not heard of it; most people could give some explanation of its meaning for their lives. An institutionalized concept of change, especially planned change, is not a traditional part of most African societies--although it would be incorrect to think of indigenous societies as unchanging and fixed. Recent historical evidence suggests that before western contact African cultures were constantly in flux and that some transformations even occurred quite rapidly. What is new is the conscious, widely-discussed, and publically articulated notion of change (maendeleo) as a goal to be sought, as providing benefits to local communities and the nation as a whole, and as a regular part of life.

In addition to this conceptual change, development has become institutionalized in the organizational hierarchy of the governmental bureaucracy. Two of the most influential officials whose cooperation is essential for the success of the proposed project carry titles indicating the importance of development to Tanzania. These are: at regional level, the RDD (Regional Development Director) and his district-level counterpart, the DDD (District Development Director) (See Figure VII-11). Thus, the ability of the Regional and District Engineers to carry out their crucial role in the program depends on their working with the RDD and DDD in justifying program goals with general development guidelines established for the regions and districts.

Ujamaa, Tanzania's form of African socialism, is government policy throughout the various regions of the country. As a unifying political ideology and development goal for the country, it has helped forge similarities across the more than 120 different language groups. Ujamaa exists in two forms. Ujamaa Vijihini, or "ujamaa in the villages," is simply collective movements and organizations, such as community-owned shops, bus companies, marketing cooperatives, and the like. It can exist independently of vijiji vya ujamaa, or "ujamaa villages." Ujamaa villages are reorganized local communities made up of people wo live together in newly-established collective villages. Such villages have many cooperative enterprises (shops, marketing cooperatives, etc.) and do not exist independently from the idea of "ujamaa in the villages." Thus, there are in effect two degrees of ujamaa which are officially recognized. These two models are in operation in different parts of the country and take onto account, to some degree, the regional differences among the cultures of Tanzania. In Singida and Dodoma Regions, for example, most villages outside the urban areas are organized as ujamaa villages, a change which took place only during the 1970s for the most part. In Same/Mwanga where settlement patterns are quite different because of higher population density and mountainous terrain, ujamaa villages are almost unknown but there are many cooperative enterprises (organized along the model of "ujamaa in the villages") together with some private enterprise.

Villagization, a third aspect of post-independent planned changes in Tanzania, has been undertaken as government policy in areas where people previously lived in dispersed settlements. The most important consequence of this change has been the aggregation of population in rural areas of the country in closely-knit communities making it possible to undertake cooperative ventures and provide basic social services more easily. Villagization of Singida and Dodoma Regio during the 1970s transformed the nature of the vast majority of these regions. In Same/Mwanga, villagization has not occurred to any significant degree.

(a) Organizational Arrangements

These changes (resulting from development, ujamaa, and villagization) which have taken place relatively recently in Tanzania have important consequences for the probable implementation of the project. In order to take into account the nature of Tanzanian communities and government ideology in the 1980s, it is conceivable that parceling out local maintenance jobs to communities, rather than to individuals, might work exceedingly well. In certain rural areas of Singida and Dodoma these maintenance programs (to be administered by village chairmen) might have a much higher probability of success. Since there would be local interest in the jobs and in the income they would produce for the community, local "pressure" might well be enough to ensure that the jobs are done. Community-based (as opposed to individual-based) responsibility for maintenance jobs would also mean that specific individuals could be replaced when sick or otherwise unable to work. Since a large supply of available labor exists in all these communities, finding individuals to do the work would present no difficulty for the respective communities which are assigned the jobs. Training, however would be a more difficult task for the maintenance teams.

In those areas like Same/Mwanga where the ujamaa organization is not so well developed as it is in Singida and Dodoma, or in more isolated areas, it would be more appropriate to assign local-level maintenance jobs to specific individuals.

(b) Institutions Likely to Promote Self-Help Projects

It is important to note that the local government and party organizations are, for the most part, strong and able units for mobilizing local community efforts. Especially in those areas where people live in ujamaa villages, the governing structure of the village has far greater capacity (indeed, perhaps the only real capacity which exists) for organizing self-help and village level activities. Cooperatives (such as community-owned shops, bus companies, etc.) are closely related to village governing committees. Thus, any efforts to mobilize the local population for participation in development projects stand a better chance for success when undertaken through these units. Since such strong organizatio exists, it can and should be depended upon for implementation of those parts of the project which require cooperation of villagers. Even in areas like Same/Mwanga, local government and party committees are also strong and can be depended upon as the best and most likely unit to elicit local cooperation.

(c) Incentives and Benefits to Retain Staff

The principle incentives to retain staff are believed to be:

(1) Ensure the jobs continue to pay as well as competitive employment might elsewhere and (2) ensure that local social services, especially schools for children, housing, gardening opportunities for families, etc. are on a par with what could be found elsewhere. Many Tanzanians prefer living in rural areas as opposed to the larger cities as rural areas are generally considered better places for families. Only better social services, more money or work opportunities closer to extended family are sufficient incentive to move.

V

V. ECONOMIC ANALYSIS

A. Economic Potential

1. Strategies of Development

Tanzania's development philosophy as expressed in the Arusha Declaration of 1967 is aimed at achieving three basic objectives which are considered to be interrelated and interdependent; namely, the movement to a socialist economy with direct participation of all workers and peasants in the decision making; self-reliance at both the local and national levels; and a more equitable distribution of income.[1/] The latter objective is aimed specifically at improving the quality of life of the poor majority.[2/] Egalitarian socialism was to be achieved through a strategy of nationalization of all major means of production and the organization of financial and economic institutions based upon the principle of participatory decision making.

Shortly after the Arusha Declaration, the Tanzanian Government nationalized the banks, export and import trade, plantations, large industries and other means of production.[3/] The Government has also created a large number of parastatal institutions, such as the National Milling Corporation, General Agricultural Products Export Corporation, Tanzania Livestock Marketing Corporation, and the Tanzania Cotton Authority, which are concerned with processing and marketing of agricultural commodities. A further step taken by the Government was that of the Ujamaa village movement with its communal ownership and production. In 1972, the Government instituted a decentralization process which seeks to bring development directly to the poor in Tanzania's villages. This process coupled with the villagization program is expected to reduce the isolation of the small farmers.[4/]

1/ See Kighoma A. Malima, Planning For Self-Reliance, Tanzania's Third Five Year Development Plan, Economic Research Bureau, University of Dar es Salaam, Paper 78.1, January 1978.

2/ Agency for International Development, Department of State, Country Development Strategy Statement, FY 1981, Tanzania, January 1979.

3/ Malima, Paper 78.1, p. 2.

4/ Data on number of households from a recent IBM run by the Bureau of Census of the Population Census of 1978 show that 96.2 per cent of all the households on the Tanzanian mainland are now in villages.

The villagization program is also emphasizing the development of production "through individual, block, and communal modes of production," with the surplus to be sold through primary cooperative institutions.[1/] With abolishment of the Cooperative Unions in April/May 1976 each village was allowed to become a primary cooperative with authority to sell directly to the parastatal crop authorities.

Among other positive benefits of the villagization program in the rural areas is that of greater access to governmental services. This is especially so in the case of educational facilities. Improvement in rural water supplies has also been facilitated through the villagization program.

2. National Development Plans

The Tanzanian Government has operated under a series of five year plans for economic and social development. The current Third Five Year Development Plan (1976-81) is the last element of the long-term plan (1964-80) launched in 1964. Each of the two preceding plans covered the 1964-69 period and the 1969-74 period. Although the first two plans, which focused on Gross Domestic Product growth, self-sufficiency, standards of living and average life expectancy, did not produce the target goals, significant progress was attained. It became obvious to the government that greater investments will be required to reach the ambitious targets specified through the cooperative efforts of all levels of government.

In the Third Five Year Plan, GDP is projected to grow at an average rate of 6 per cent per year compared to an average growth rate of 4.8 per cent per annum during the Second Five Year Plan. Monetary GDP is estimated to grow at an average rate of 6.75 per cent per annum and subsistence GDP at an average rate of 3.9 per cent per year. During the 1971-1975 period the actual growth rates of monetary GDP and subsistence GDP were 4.5 per cent and 3.5 per cent per annum respectively.

To arrive at this average rate of GDP and at the various sectoral growth rates, it is estimated that an allocation of investment expenditures of T/shs 22,585 million would be required. The targeted average

1/ Food and Agriculture Organization of the United Nations, An Analysis of Agricultural and Rural Development Strategy in Tanzania, 1977-1990, Dar es Salaam, July 1976, p. 1.

growth rate of 6 per cent reflects economic developments in the past years. From the sectoral allocation of T/shs 26,978 million, as planned for the five-year period, the average growth in GDP should exceed 6 per cent per year.

In 1977, the GDP nearly reached the targeted growth rate. The actual increase for that year was 5.9 per cent (in constant prices) compared with increases of 5.2 per cent and 4.6 per cent in 1976 and 1975 respectively.[1/] In the past year or so, however, there has been a slowing of the economy, largely as the result of the soaring costs of imported petroleum products which are absorbing a large proportion of the country's foreign exchange.[2/]

During the period 1971-1975 the actual increase in the sectoral GDP was: agriculture 3 per cent; industry 6 per cent; water and power 8.3 per cent; transport and communications 4.5 per cent. Mining declined by 2.5 per cent. From this performance it is obvious that efforts will have to be increased in order to achieve the targets projected for the Third Five Year Plan.

In order to attain the proposed rate of growth in the GDP during the plan period the sectoral distribution of investment will be as follows:

TABLE V-1
SECTORAL DISTRIBUTION OF CAPITAL INVESTMENT

	Amount (T/shs 000)	Percentage
Agriculture	3,331,840	12.35
Livestock	630,306	2.34
Natural resources	416,701	1.54
Mining	923,296	3.42
Industry	7,196,496	26.68
Commerce and tourism	576,664	2.14
Water	1,472,742	5.46
Construction	2,679,740	9.93
Power	1,352,790	5.01
Communication and transport	2,204,735	8.17
Education and culture	1,717,347	6.37
Health	778,119	2.88
Administration and others	3,697,575	13.71
Total	26,978,301	100.00

1/ The Economic Survey, 1977-78, United Republic of Tanzania, printed by the Government Printer, 1979, p. 6.
2/ Oil imports are expected to absorb about 45 per cent of the foreign exchange in 1980 compared to 10 per cent in 1972 (Daily News 3/26/80).

The objectives of the regional development plans under the Third Five Year Development Plan include: (1) narrowing the economic and developmental differentials among regions; (2) narrowing the gap between urban and rural areas; (3) development of regional towns as a nucleus for regional and village development; and (4) village development and strengthening. Regional development programs focus on 1) the social infrastructure (education, health and water projects), 2) the economic infrastructure (communications and works, land and surveys), 3) the directly productive subsectors (livestock, agriculture and natural resources), 4) small scale industries programs, and 5) national culture programs. A summary of the distribution of regional development funds by sector is presented as Table V-2.

TABLE V-2
SUMMARY OF THIRD FIVE YEAR DEVELOPMENT PLAN: DISTRIBUTION OF DEVELOPMENT FUNDS IN EACH SECTOR IN THE REGIONS (T.Sh.000000)

Production of Goods		Social Infrastructure	
Agriculture	329.8	Education	418.2
Livestock	166.9	Health	256.1
Industries	46.3	Water	362.4
Natural resources	102.6	Total	1,036.7
Total	645.6		

Economic Infrastructure	
Land	55.5
Construction	487.7
Total	543.2

		Percentage (%)
Production of Goods	645.6	29.0
Social Infrastructure	1,036.7	46.6
Economic Infrastructure	543.2	24.4
Total	2,225.5	100.0

3. Donor Support in Related Economic Activities

The foreign assistance component of foreign grants and loans to the Tanzanian Government amounted to approximately $475 million in FY 1978/79.[1/] In addition, private voluntary agencies make contributions in various assistance areas which are not included in the above. Current assistance by major donors has been estimated at a level of about $394 million.[2/]

1/ Agency for International Development, Department of State, Country Development Strategy Statement, FY 1981 Tanzania, January 1979, p. 31.
2/ AID Strategy Statement, p. 32.

Over the years, only a relatively small proportion of the foreign assistance program has been designated for the regions involved in the present study, i.e., Dodoma, Singida, and the Mwanga/Same districts of Kilimanjaro. Much of this assistance to the study regions has been in the form of feasibility studies with follow-on investments often times not materializing. Among the major studies provided under the foreign assistance program were:

--Dodoma Region Integrated Rural Development Plan, prepared by the Canadian International Development Agency (C.I.D.A.) for the Office of the Prime Minister, January 1975. (This was the first integrated development plan for the Dodoma Region.)

--Dodoma Interim RIDEP, Tanzania, an interim regional development plan prepared by the United Nations Department of Technical Cooperation for Development with the collaboration of the Food and Agriculture Organization for the Office of the Regional Development Director, Dodoma, January, 1980 (in five volumes). The Plan consists of the formulation of nine interim development programs covering land use planning, agriculture, livestock, rural credit, natural resources, village development, industries and handicrafts, rural water supply, and road improvement. Total cost of the programs is estimated at 225.8 million T/shs, about $27.2 million. The Plan has been approved by the government, and the latter is now seeking donor assistance for implementation of the Plan.

--Australian Development Assistance Bureau, Singida Integrated Livestock Development Study, Feasibility Study for the Government of the United Republic of Tanzania, prepared by G.P. McGowan Associates Pty Limited, January 1978. The study identified 10 projects including further studies with an implementation cost of T/shs 45.99 million (U.S. $5.6 million), of which T/shs 29.8 million (U.S. $3.5 million) would be foreign exchange. Only a small portion of the plan has been implemented.

--Australian Development Assistance Bureau, Singida Region Water Resources Survey, prepared by Snowy Mountains Engineering Corporation, May 1978 (in five volumes) and Tanzania Groundwater Development Project, December 1973. The Australian involvement in the water resources in Singida Region began with the issuance of the

consultant's report in December 1973. This was followed up in 1975 with implementation of a program to provide drilling rigs and associated equipment and expertise to develop village water supplies and train local drillers and mechanics. In 1976, the program was extended to include installation of pumps and windmills. The program was further extended in 1978 and expanded to include a shallow well program, and installation of diesel-driven pumps and windmills on boreholes. In this latest expansion phase (stage 3, 1978-80) the estimated Australian contribution is Australian $1,763,000.[1/]

--Japan International Cooperation Agency, Water Master Plan Kilimanjaro Region, prepared by the Water Master Plan Team, December 1977 (in eight volumes). This study covered the entire region of Kilimanjaro with respect to existing facilities, future requirements, and recommended domestic and irrigation schemes to be implemented. The total cost of the recommended schemes for the Kilimanjaro Region consisting of surface water, boreholes, springs and furrow irrigation systems through 1995 are estimated at T/shs 136.5 million.

The projected implementation program for the Same and Mwanga districts (both domestic and irrigation) includes 31 schemes for rural water production at a cost of T/shs 6.9 million, and a Same urban scheme at T/shs 5.2 million. Recommended technical studies and field tests are currently underway as part of the first phase of implementation of the Master Plan.

Two current transportation projects being financed by foreign assistance which will impact upon part or all of the study regions is the rehabilitation and paving of the Morogorro-Dodoma trunk road, and the rehabilitation and expansion of the Tanzanian Railway Corporation lines which link Dar Es Salaam and Tanga to Kilimanjaro, Arusha, Dodoma, Singida, Taboara, Mwanza and Kigoma. The road paving project, being financed by Brazil, is expected to be underway shortly, while the railway project, being financed by Canada, has been underway for some time.[2/]

1/ Tanzanian Water Development Project, Stage 3, Quarterly Report No. 10, Oct.-Dec. 1979 for the Australian Development Assistance Bureau, Department of Foreign Affairs, Australia by Snowy Mountains Engineering Corporation.

2/ For more information on the railway project see Part III-C.

B. Agriculture

1. Agriculture's Role in the National Economy and in the Study Zones

Agriculture is the main economic activity of Tanzania. It accounts for about 39 per cent of the Gross Domestic Product and about 73 per cent of the total value of exports.[1/] The major agricultural exports are coffee, cotton, sisal, cloves, tobacco, cashew nuts, and tea. About 84 per cent of the labor force is employed in the agricultural sector,[2/] while nearly 60 per cent of the agricultural production is at the subsistence level.[3/] For the three regions of this study, agriculture also dominates the economic activity. For example, in Dodoma region, about 87 per cent of the rural population is presently engaged in agriculture (90 per cent of the males and 84 per cent of the females).[4/] In 1974, about 94 per cent of the population of Dodoma region was reportedly dependent upon agriculture for their livelihood.[5/]

Nearly all of the agricultural labor in Dodoma region is self-employed, with agricultural workers representing less than one-half of one per cent. Similar conditions regarding the role of agriculture prevail in the other two study regions, Singida and the Same/Mwanga districts of Kilimanjaro.

2. Agricultural Land Use

Tanzania has a total land area of about 800,000 km^2. About 20 per cent of this land area is cropped, of which 10 per cent lies fallow for varying periods of time. The other 80 per cent of the land area is made up of rough grazing (rangeland or indigenous brush) of which approximately 18 per cent is designated as game reserves or forest reserves.[6/]

Estimates of land use for two of the three study regions, Dodoma and Singida, show that for Dodoma, smallholder cultivation occupies about 317,000 hectares, or 7.8 per cent of the region's total area, while for Singida, the smallholder cultivation totals about 158,000 hectares, representing just over 5 per cent of the region's area (see Tables V-3 and V-4).

1/ The United Republic of Tanzania, The Economic Survey 1977-78, printed by the Government Printer, Dar es Salaam, Tanzania, 1979.
2/ The World Bank, World Development Report, 1979, Annex II, p. 162.
3/ Computed from data in The Economic Survey 1977-78, Table 4, p. 12.
4/ The National Demographic Survey of Tanzania, 1973, as cited in Tanzania Dodoma Interim RIDEP, Main Report, p. 129, January 1979.
5/ C.I.D.A., Dodoma Region Integrated Rural Development Plan, January 1975, p. 20.
6/ Food and Agriculture Organization, Livestock Development Country Studies, Vol. II, Rome, December 1977.

TABLE V-3

LAND USE BY DISTRICTS, DODOMA REGION[1/]

Land Use Categories, District and Region		Area (Hectares)	Per Cent of Land Area
Dodoma			
Smallholder cultivation		140,000	8.7
Rough grazing		1,490,720	90.9
All other uses and unused areas		7,680	0.5
	Total	1,638,400	100.0
Kondoa			
Smallholder cultivation		110,000	8.4
Rough grazing		844,170	64.7
All other uses and unused areas		351,430	26.9
	Total	1,305,600	100.0
Mpwapwa			
Smallholder cultivation		66,972	5.9
Rough grazing		806,918	70.8
NDC ranches		36,440	3.2
All other uses and unused areas		228,870	20.1
	Total	1,139,200	100.0
Dodoma Region			
Smallholder cultivation		316,972	7.8
Rough grazing		3,141,808	76.9
NDC ranches		36,440	0.9
All other uses and unused areas		587,980	14.4
	Total	4,083,200	100.0

1/ Most data are best estimates only from 1969-71.

Source: From Study of Feasibility of Developing a Livestock Extension Project for Farmers on Small Holdings in Tanzania With Emphasis on Semiarid Areas, prepared by Gail E. Pate, D.J.M. Contract No. AID+GRI-oll-T, March 6, 1980.

TABLE V-4

LAND USE BY DISTRICTS, SINGIDA REGION[1/]

Land Use Categories, District and Region		Area (Hectares)	Per Cent of Land Area
Singida			
Smallholder cultivation		60,000	4.7
Rough grazing		982,020	77.5
Low altitude woods and forests		217,500	17.2
Urban, rocky, swamps, etc.		7,680	0.6
	Total	1,267,200	100.0
Manyoni			
Smallholder cultivation		32,500	1.1
Rough grazing		1,096,250	38.8
Low altitude woods and forests		1,663,800	58.8
Urban, rocky, swamps, etc.		36,250	1.3
	Total	2,828,800	100.0
Iramba			
Smallholder cultivation		65,000	8.3
Rough grazing		684,550	87.7
Urban, rocky, swamps, etc.		31,250	4.0
	Total	780,800	100.0
Singida Region			
Smallholder cultivation		157,500	5.3
Rough grazing		2,762,820	92.2
Urban, rocky, swamps, etc.		75,180	2.5
	Total	2,995,500	100.0

1/ Most data are best estimates only from 1969-71; others are from 1976-77, Australian Development Assistance Bureau, Singida Integrated Livestock Development Study, Vol. 1, p. 33.

Source: From Study of Feasibility of Developing a Livestock Extension Project for Farmers on Small Holdings in Tanzania With Emphasis on Semiarid Areas, prepared by Gail E. Pate, D.J.M., Contract No. AID-GRI-oll-T, March 6, 1980.

About three-quarters of Dodoma region's land area is in rough grazing, while for Singida region this category exceeds 90 per cent of the total area. It is interesting to note that for the Dodoma region, Mpwapwa district had the least quantity of smallholder cultivation in 1970/71 and presumably in 1974/75 also (since the Dodoma Region Integrated Rural Development Plan of January 1975 shows essentially the same percentages of cultivable land by districts as that shown in Table V-3). But in 1978/79 it was the most important maize district in the country. Of course, this could occur for two reasons: first, there have been increases in cultivated areas since 1970/71 or 1974 (which is probably true) and secondly, Mpwapwa obtains greater yields on the land which it cultivates, which also from all field reports is true.

Unfortunately, similar data to those shown in Tables V-3 and V-4 are not available for the Same/Mwanga districts of Kilimanjaro. If they were, it is highly likely that the percentage of cultivated area (but not total cultivated area), would be substantially higher than that for Dodoma and Singida regions, particularly in the Pare Mountains where most of the population lives.

3. Agricultural Practices

a. Introduction

This discussion of agricultural practices with regard to food and cash crops deals with Dodoma and Singida as largely homogeneous regions, since the crop husbandry is similar. In the case of the Same and Mwanga districts of Kilimanjaro region, some of the agricultural practices differ from the other two regions, and thus these differences will be pointed out.

b. Food and Cash Crops

(1) Shifting Cultivation

Agriculture as practiced in the Dodoma and Singida regions has been dependent for many years upon the traditional methods of shifting cultivation coupled with the production of subsistence crops. Both regions have very little developed irrigation, and thus have been dependent upon erratic and inadequate rains in many parts of the two regions.

Shifting cultivation in Tanzania involves moving into a new area; clearing the land through cutting and burning;

and then planting, weeding, cultivating and harvesting the first crop. The land is then left fallow for another two to three years, while other plots are being treated in the same manner. Although leaving the land fallow allows the soil fertility to rejuvenate itself, destruction of the vegetation cover often times leads to serious erosion before the new weeds, native grasses and brush have had time to take over.

The ash residual from burning of the vegetation, which is left on the land, also adds to the soil fertility, but complete destruction of the vegetation without an immediate replacement cover crop such as legumes, following the harvesting of the initial cereal crop, leads to the erosion problem mentioned previously.

Shifting cultivation has been practiced to a lesser extent in the Same and Mwanga districts of Kilimanjaro region. This is largely because the mountainous areas of these districts with their dense populations have an acute land shortage, especially in the North Pare Mountains. There has been some shifting cultivation on the plains, where parcels of land are largely owned by people who live in the mountains, but this type of cultivation has been quite limited.

(2) Continuous Cropping and Intercropping

In recent years, continuous cropping has begun to evolve for a number of reasons. Among them are the following:

--The ujamaa program, which has brought rural families together into the villages with more or less defined boundaries. The ability to engage in shifting agriculture is thus limited as more of the new village land is developed;

-- The growing population and increase in livestock have put pressure on land use and land availability;

--Prohibition against clearing native forests; and

--Encouragement by the government of intercropping of cereals such as sorghum and bulrush millet which when grown in combination tend to reduce the chances of crop failure. Of even greater importance in the present intercropping pro-

gram is that of legumes being planted with cereals. The legumes increase the fertility of the soil by largely replacing the nitrogen absorbed by cereals.

Intercropping has been a normal practice for many years in the Pare Mountains of Same and Mwanga districts,[1/] but the practice was not always aimed at increasing the fertility of the soil. For example, coffee and bananas (and occasionally fruits) are normally interplanted. Although a major reason for this interplanting is to provide shade for the coffee trees, the bananas do provide an additional food subsistence crop, and at the same time increase utilization of the scarce land. Maize, beans and cassava are also interplanted in these districts. In this instance, the beans (a legume crop) do serve to restore fertility to the soil.

(3) Areas of Cultivation

The average size of areas of cultivation in the three study regions are small, since they are representative of smallholders utilizing traditional methods of hand cultivation limited by the size of families.[2/]

In the Singida region, the average area cultivated in 1975 was reported as 1.6 hectares (3.8 acres).[3/] For the Dodoma region, the Dodoma Regional Development Committee (RDC) established three acres as a minimum for each family to cultivate, of which two acres were to be in food crops and one acre in cash crops.[4/] Agricultural crop specialists in the region indicated that most of the farm community had exceeded this minimum, with actual area of cultivation now averaging 3-4 acres for food crops, and 1 acre for cash crops. The average farm size in the Same/Mwanga district is estimated at somewhat less than 1 hectare (2.4 acres) in the Pare Mountains with all of it under cultivation every year. In

1/ See Bureau of Resource Assessment and Land Use Planning, University of Dar es Salaam, Agro-Economic Zones of North-Eastern Tanzania, Research Report No. 13, Oct. 1970, p. 63.

2/ There are exceptions to this in some areas such as Kondoa and Iramba districts where a substantial number of oxen are being utilized for ploughing and cultivation. (See (7) Farm Power of this section.)

3/ Australian Development Assistance Bureau, Singida Integrated Livestock Development Study, Volume I, p. 36.

4/ Information provided by District Agricultural Development Officer, Dodoma Rural District.

the plains areas of Mwanga and Same the farms are estimated to average from 1 to 2 hectares (2.4 to 4.8 acres), with most of the land cultivated, although on the larger farms some land is often left fallow.[1/]

(4) Crop Types

The major crops among the cereals grown in the Dodoma and Singida regions are maize, sorghum and millet (bulrush and finger). Maize is the primary and preferred subsistence crop (and a major commercial crop) although the people also consume the other cereals. Other food crops grown include sweet potatoes, yams, and cassava (which are planted as famine reserve crops), mixed beans, small quantities of cowpeas, pigeon peas, and various fruits and vegetables. To this listing from Same/Mwanga, one must add sugar cane, bananas, and paddy. The so-called cash crops, which are also largely food crops of a type, but are grown primarily for commercial purposes, include the oilseeds (sunflower, castor, simsim (sesame), groundnuts), grapes, cotton and tobacco. Other cash crops of great importance to the Same/Mwanga districts are coffee, cardamom and sisal.

The government is encouraging the planting of new varieties of sorghum (Lulu and Serena), which are more drought-resistant than the traditional varieties. Similarly it is encouraging the expansion of bulrush millet, which is also of a drought-resistant type. An expansion in sunflower production is also being urged by government officials in both the Dodoma and Singida regions. Improved seed for this crop as well as some castor and sesame is being distributed to a number of the villages throughout both regions. This is a part of the national Third Five Year Development Plan which seeks to stimulate increased oilseed production among other agricultural goals.

Growers of grapes in the Dodoma Urban and Rural districts are strongly urged to expand production in order to provide an assured and adequate supply to the new winery to be constructed near Dodoma town.

1/ BRALUP, Agro-Economic Zones of North-Eastern Tanzania, pp. 63, 66.

(5) Soil Erosion

Soil erosion is a very serious problem in many parts of all three study regions. Along with shifting cultivation, and the cultivation of steep slopes, overstocking and overgrazing of livestock have been the major causes of the erosion.

One of the hardest hit areas is the rolling hill country of Kondoa district in Dodoma region. The situation became so bad, entire villages along with their livestock were moved out into other more favorable areas for settlement with additional conservation steps being taken by the government to try and reclaim the old areas--a process which will require many years, if at all successful.

Soil erosion has also become a serious problem in the Same and Mwanga districts, particularly in a wide belt of relatively flat country adjacent to the highway and extending north from Same toward Moshi. This problem has come about by converting grazing land to farming land which in turn has caused floods and erosion. The result has been the creation of a near-desert area. The government is considering moving out the people and cattle to possibly the Morogoro region, but no action has thus far been taken.

Soil erosion is also a major problem in the mountainous areas of the Same and Mwanga districts with coffee and other crop cultivation being practiced on the steep slopes. Some growers have used contour banks or terraces, particularly for their coffee plots, but the practice is by no means widespread.

There are a large number of known measures which can be taken to reduce soil erosion, but this requires an improved land/management program with trained technicians, a widespread educational program providing direct contact with the producers, and strong government backing. (See Dodoma Region Integrated Rural Development Plan, by C.I.D.A., January 1975, on "Methods of Controlling and Preventing Erosion," p. 23.) As indicated previously, the government is aware of the problem and is taking measures, but the situation is desperate in many areas.

(6) Fertilizers

Little chemical fertilizer is presently being used in the three study regions, even for the commercial cash crops such as coffee, cotton, and tobacco. This reflects the official government policy that smallholders not be encouraged to use such fertilizers at the present time because of inadequate crop husbandry, and unfamiliarity with its use. For example, the Coffee Authority of Tanzania is not recommending any use of fertilizer to smallholders because it is considered a waste of money and energy as long as the husbandry of small coffee farms was insufficient.[1/] The CIP (Coffee Improvement Program) initiated in 1978 is concentrating upon improved farm husbandry (through proper pruning) to increase yields. With the satisfactory completion of this program, the growers can then start using fertilizers.

An additional reason for not encouraging chemical fertilizer on a widespread basis for all areas is that it requires adequate rains after application to be of any use. In fact, if there are not sufficient and consistent rains after application, the fertilizer may reduce crop production to a lower level than if the fertilizer had not been applied.[2/]

Green manure is used although only by a limited number of the producers. All three of the regions have large quantities of manure, since it is estimated that "each animal will produce one ton of manure per annum of which 60 per cent (600 kg.) can be collected from the night corrals."[3/] Since the 1978 census shows that the three study areas have a total cattle population of 2,428,000 head, this means that a potential annual supply of nearly 1,500,000 metric tons is available for use.

1/ See J.S. Garren, Report on the Fertilizer Requirements in Tanzania, Laren, N.H. (USA), April 25, 1978. Mr. Garren reported that although officially the smallholders are not encouraged to use commercial fertilizers, it is known that several are buying. He then estimates this quantity at 3 per cent of the quantity used by the coffee estates.

2/ See C.I.D.A., Dodoma Region Integrated Development Plan, 1975, p. 8.

3/ C.I.D.A., p. 8.

The present difficulty with this huge potential manure supply is that it doesn't happen to be distributed evenly throughout the country so that all cultivators would have cattle corrals next to their fields or within very short distances. In some localities the corrals are relatively close, but in others they may be miles away. Even two or three miles are quite long distances, when the producer has no way of transporting the manure except by back or head carry. To alleviate this situation, the farmers have been urged to utilize their oxen and donkeys for transport, but this program has met with difficulties in many areas because of traditional concepts against use of such animals for draught purposes of any kind. Other difficulties have been the lack of experience of the personnel in training the oxen, insufficient funding for ox-training programs, and insufficient interest on the part of the extension agents. An additional problem associated with greater use of green manure is that substantial number of farmers have not been made aware of the value of the green manure as a stimulant to production, even though increased use of farmyard manure is one of the production strategies in the Third Five Year Plan for achieving self-sufficiency in food crops.

A bright exception to this resistance to using animal power for transport is in Iramba district, in which 296 ox carts drawn by ox teams are being utilized. The district also has about 1,900 donkeys, which the District Agricultural Development Officer reports are mainly being used for transportation. Ox cart transportation is also slowly being adopted in Singida district. Iramba and Singida districts have small ox cart manufacturing shops which combined are turning out about 200 carts per year.

(7) Farm Power

The traditional agricultural implement used in the three regions is the hand hoe or "jembe," and it is wielded much more by the women than the men, although in certain areas men were seen working in the fields, primarily for weeding pur-

poses. The children, when not in school, were also seen working in the field with the hoe. The amount of land which can be cultivated by a hand hoe is, of course, quite limited. In recognition of this fact, and in the desire to increase agricultural food production in working toward the national goal of food self-sufficiency, ox-training programs have been introduced to promote the use of oxen throughout the Dodoma and Singida regions as well as in other parts of the country.

Aside from the Kondoa and Iramba districts, which already had begun to use oxen, the effort has not been successful. In recent discussions by the consultant with knowledgeable officials, it was indicated that an additional attempt would be made to develop more interest in training and utilizing the oxen for that purpose. Such a program is being included in the Dodoma Interim RIDEP. It provides for the strengthening of old ox-training centers and of training units, with an estimated cost of about T/shs 820,000.[1/] About 41,000 hectares are cultivated annually by draught animals (oxen) in the Kondoa district of Dodoma. Nearly 18,000 oxen have been trained for this purpose in the district. For the other districts of the region, less than 500 hectares in all are cultivated by draught animals.

In Iramba district of Singida region, 42,336 oxen were used for ploughing and cultivating in the 1978/79 season.[2/]

One estimate of the advantage of using oxen is that the time required for an ox plough to plough and harrow one hectare is 8 man-days, while 65 man-days per hectare are required by hand.[3/]

c. Livestock

(1) Introduction

Information and data on livestock practices were obtained by the consultant from personal interviews with knowledgeable

1/ See Dodoma Interim RIDEP, Volume III, pp. VII-105 through VII-13.
2/ Data are from District Livestock Development Officer, Kiomboi.
3/ Australian Development Assistance Bureau, Singida Integrated Livestock Development Study, p. 36.

persons associated with the industry both in Dar es Salaam and during the extensive field survey. Secondary data sources were also used to supplement the interview information and data, among them a comprehensive survey of the traditional livestock industry by a team from Texas A & M University in 1975/76. This survey covered seven regions including Dodoma and Singida.[1/]

(2) Traditional Management Practices

Traditional management practices for livestock prevail throughout Tanzania. Approximately 90 per cent of the cattle in Tanzania are estimated as being raised under the traditional management practices.[2/] This means that the traditional herdsman keeps his livestock primarily to meet the nutritional needs of his family. It is thus a subsistence enterprise. But in addition to the necessary supplies of meat and milk which he derives from his herd, he also engages in the intermittent sale of his cattle which enables him to fulfill his other subsistence needs.[3/] Hides and skins are additional products which he obtains from an occasional slaughter of his livestock, and which are used for both home consumption needs as well as a source of income.

The herd also serves as one of the few methods available in a largely subsistence economy to accumulate capital and at the same time to serve as a hedge against inflation. In addition, the herd is an insurance policy against starvation during the recurrent dry seasons or the less frequent but severe droughts which occur in Tanzania.

Additional purposes which the herd serves are of a social nature and include the use of cattle as a dowry (payment of bride wealth), as a prestige factor, and in accordance with tribal traditions. But these social factors were found to be of relatively minor importance (according to the Texas A & M survey), compared to those of an economic nature previously discussed.

1/ See Tanzanian Livestock-Meat Subsector, prepared by Texas A & M University for the U.S. Agency for International Development, October 1976.

2/ Ibid., "Survey of Traditional Livestock Industry," Vol. II.

3/ K.W. Stokes, Livestock Economist, Texas A & M/TLMC, unpublished report.

An additional complicating economic factor at the present time, which may very well reinforce the herdsman's desire to retain his cattle is the fact that with the economy at a low ebb, the opportunities to purchase exchange goods are much more limited. In addition, with rising cattle prices in recent years, the traditional herdsman is now receiving more money per head (with little additional expenditure in production), thus he need sell fewer cattle to meet his additional needs.

It can be concluded that for whatever reasons, economic or social, the traditional herdsman in Tanzania does retain his livestock for much longer periods of time than those prevalent in the non-traditional sector of the industry. For example, average age of slaughter cattle in the study regions from the traditional herds were cited as ranging from seven to ten years, while the national cattle ranches were reported to be selling at an average age of about four years.

This abnormally long retention of cattle has led to serious overstocking. Stocking rate trials at Kongwa Pasture Research Station over the years indicate that good natural pasture can carry one adult steer to 4 hectares (a ratio of 1 to 10 acres), although these figures can vary according to season and locality.[1/]

For the Dodoma and Singida regions as a whole, natural grazing is considered to be of the fair variety, and thus a stocking rate of 1 animal to 8 hectares is generally considered as necessary. Estimates of stocking rates for the Dodoma region show the following in terms of number of hectares per livestock unit.

Dodoma Rural and Urban	1.45
Mpwapwa	3.27
Kondoa	1.45
Region	1.79

Source: Dodoma Interim RIDEP, Vol. IV, Annex VIII, p. VIII-2.

1/ As quoted in C.I.D.A., Dodoma Region Integrated Rural Development Plan, January 1975, p. 50.

Based upon the above accepted yardstick, the region is definitely overstocked.

Overstocking and overgrazing are both very serious problems throughout the Tanzanian livestock industry, and especially so for the semi-arid conditions of the two study regions, Dodoma and Singida.[1/] These are two of the basic causes of soil erosion, which have been previously referenced in this section in the discussion of agricultural practices in crop production. In addition to the erosion problem, overgrazing also causes a decline in the quality of the pastures, since the better natural grasses tend to be replaced with lower quality, less productive, and less palatable types. Removal of the grass cover also encourages the regrowth of brush.

4. Supporting Services

a. Credit Institutions

The major credit institutions serving the study regions are the National Bank of Commerce (NBC) and the Tanzanian Rural Development Bank (TRDB). The Tanzanian Cotton Authority also provides credit to cotton growers in the Singida region and the Same/Mwanga districts of Kilimanjaro.

The NBC provides short- and medium-term credit to commercial shops in the villages, other businessmen in the towns and government officials. The TRDB provides short-, medium-, and long-term credit to the villages, district development cooperatives, and a few individuals for the purchase of farm implements, seasonal inputs (fertilizers, seeds and pesticides), maize mills, tractors, vineyards, livestock, fishery, rural transport, and other types of economic ventures (see Tables V-5 and V-6). The terms of the three types of loans granted by TRDB are as follows:

Type	Time Period	Interest Rate (%)
Short-term	Up to one year	7.5 (for villages)
		9.0 (for institutions)
		10.0 (for individuals)
Medium-term	2 to 5 years	7.5
Long-term	5 to 25 years	7.5

1/ See C.I.D.A., Dodoma Region Integrated Rural Development Plan, January 1975.

TABLE V-5

TANZANIA RURAL DEVELOPMENT BANK, DODOMA REGION LOAN PORTFOLIO, 1972/73 THROUGH DECEMBER 31, 1979 (T/shs)

Loan Category	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	Total
Hides and skins	84,843	-	-	-	-	-	-	-	84,843
Tractors	719,110	193,515	-	-	-	120,000	-	-	1,032,625
Vineyards	-	500,000	-	-	-	-	192,400	562,565	1,254,965
Maize mills	-	-	47,170	42,550	-	354,030	962,714	546,200	1,952,664
Trp. (buses & lorries)	-	-	1,185,825	682,347	-	1,230,750	-	-	3,098,922
Ranches	-	-	990,606	1,321,300	1,415,821	-	-	-	3,727,727
Tomatoes	-	-	-	46,010	-	-	-	-	46,010
Seasonal inputs (fertilizers, seeds, pesticides)	-	-	-	-	-	-	411,131	2,809,312	3,220,443
Poultry	-	-	-	-	-	-	115,500	-	115,500
Farm implements	-	-	-	-	-	-	495,000	41,800	536,800
Storage	-	-	-	-	-	-	1,755,000	-	1,755,000
Fishery	-	-	-	-	-	-	51,875	-	51,875
Total	803,953	693,515	2,223,601	2,092,207	1,415,821	1,704,780	3,983,620	3,959,877	16,877,374

Source: Records of TRDB office, Dodoma.

TABLE V-6

TANZANIA RURAL DEVELOPMENT BANK, DODOMA REGION LOAN PORTFOLIO BY DISTRICTS AND NUMBER OF VILLAGES, 1978/79

Loan Category	Dodoma Urban	Dodoma Rural	Mpwapwa	Kondoa	Total
Vineyards (T/shs)	192,400	-	-	-	192,400
No. of villages	5 1/	-	-	-	5 1/
Maize mills (T/shs)	55,837	311,919	311,919	283,039	962,714
No. of villages	2	11	11	10	34
Season inputs (T/shs)	-	131,500	160,500	119,131	411,131
No. of villages	-	17	23	15	55
Poultry (T/shs)	115,500	-	-	-	115,500
No. of villages	1 1/	-	-	-	1 1/
Farm implements (T/shs)	-	-	-	495,000	495,000
No. of villages	-	-	-	7	7
Storage (T/shs)	267,000	390,000	643,000	455,000	1,755,000
No. of villages	4	6	10	7	27
Fishery (T/shs)	21,875	-	-	30,000	51,875
No. of villages	1	-	-	1	2
Total loans (T/shs)	652,612	833,419	1,115,419	1,382,170	3,983,620
No. of villages with loans	7	34	44	40	125
Total no. of villages (1978)	35	123	110	152	422
Percentage of villages with loans	20	28	40	26	30

1/ Refers to individuals.

Source: Loan data are from records of TRDB, Dodoma Branch, while number of villages by district are from 1978 population census data (unpublished).

Over the past several years, the volume of loans issued by the TRDB in the three study areas has increased very substantially. This pattern is most clearly shown for the Dodoma region, since data were made available for a longer time period than for the other two regions. The TRDB annual loan volume for Dodoma increased by nearly five times, from about T/shs 804,000 to T/shs 4,000,000 in the period 1972/73 to 1979/80 (Table V-5). The pattern of growth was not continuous, however, but rather was subject to alternating peaks and valleys about every two years.[1/] In the past two years, the volume has held steady at the high of nearly T/shs 4,000,000.

Another characteristic of the loan portfolio for the Dodoma region is that it has become much more diversified in the past two years, with emphasis being placed in particular on seasonal inputs, storage facilities and farm implements, along with additional expansion of maize mills and vineyards (Table V-6).

Distribution of the 1978/79 loans for Dodoma region among the districts shows that Kondoa district received the largest amount (T/shs 1.4 million) followed closely by Mpwapwa with T/shs 1.2 million. Dodoma Rural and Urban were each below T/shs 1.0 million. Only about 30 per cent of the total number of villages in the region received any loan financing in 1978/79, one of the two largest years since 1972/73.

Loans issued by TRDB in the Singida region for 1979/80 totaled T/shs 3.9 million, approximately the same amount as the Dodoma region in that year (Table V-7). This represents about a 40 per cent increase over the 1975/76 loan volume. But in 1976/77 and 1978/79, the annual loan volumes had dropped well below the 1975/76 base. The loan program of the TRDB in Singida has concentrated upon financing rural transport, maize mills and farm machinery. Coverage has been extremely small, numbering, for example, only 12 village loans in 1979/80 in a region which contains 328 villages.

TRDB loan operations in the Same and Mwanga districts, conducted through the Moshi Branch, are small, totaling only nine loans with a volume of about T/shs 2.8 million during the entire period January

1/ The sharp drop in loans between 1975/76 and 1976/77 reflected the aftermath of the economic crisis of 1975.

TABLE V-7

TANZANIA RURAL DEVELOPMENT BANK, SINGIDA REGION LOAN PORTFOLIO, 1975/76 TO 1979/80

(T/shs)

Loan Category and Number and Type of Borrower	1975/76	1976/77	1977/78	1978/79	1979/80
Seasonal inputs (Tobacco)	1,052,297	1,153,178	812,549	1,794,074	-
No. of villages	1	1	1	1	
No. of individuals	-	-	-	-	
No. of cooperatives	-	-	-	-	
Rural Transport (lorries and buses)	637,887	-	1,923,775	-	3,292,300
No. of villages	-	-	1	-	4
No. of individuals	-	-	-	-	2
No. of cooperatives	1	-	-	-	1
Farm machinery	151,028	-	-	-	224,061
No. of villages	2	-	-	-	-
No. of individuals	-	-	-	-	1
No. of cooperatives	-	-	-	-	1
Small-scale industry (maize mills, etc.)	78,614	40,000	108,302	112,128	414,988
No. of villages	2	1	4	5	8
No. of individuals	-	-	-	-	2
No. of cooperatives	1	-	-	-	-
Livestock	906,818	-	1,372,069	-	-
No. of villages	2	-	2	-	-
No. of individuals	-	-	-	-	-
No. of cooperatives	-	-	-	-	-
Total loan value	2,826,644	1,193,178	4,216,695	1,906,202	3,931,350
Total no. of loans	9	2	8	6	19
No. villages receiving loans	7	2	8	6	12

Source: Loan data provided by TRDB Singida Branch.

1, 1973 through February 1980.[1/] Most of this activity has occurred during the past two years. The loans between the two districts have been split on about a 70/30 ratio (Same/Mwanga). Major loan categories in order of importance were: rural transport, farm machinery, and grain mills. These three categories accounted for about 80 per cent of the total loans. Six of the nine loans were made to villages, with the remaining three going to cooperatives and individuals.

The credit operations of the Tanzania Cotton Authority for its growers consist of providing fertilizers and insecticides at a subsidized price, while seed and bags for harvest are provided free. Villagers can pay cash for the fertilizers and insecticides or the amounts due can be deducted from their accounts at harvest time.

Credit facilities were deemed adequate by a TRDB official in one of the study regions, although he pointed out that there was a shortage of bank staff to assist the villagers in the preparation of feasibility studies to determine the justification for the loan applications. Certainly one can seriously question whether credit facilities are adequate in the Singida region and the Same/Mwanga districts of Kilimanjaro, with only 42 loans made to villages over the past half dozen or so years. Even in the case of Dodoma region, loans to 30 per cent of the villages appear to fall short of being adequate.

One of the problems associated with financing by the TRDB is that farmers at the present time have to travel a long way to their offices. For example, TRDB has its offices only in the regional headquarters of each region. In the study regions, these are the towns of Dodoma, Singida, and Moshi. The local TRDB manager in Dodoma mentioned that the agency had plans to establish branches in Mpwapwa and Kondoa districts. If the plans are implemented, it will be of real assistance in reducing this problem. Other possible branches might be considered for Singida (for example, at Manyoni and Kiomboi), and possible at Same for that portion of the Kilimanjaro region.

1/ Data were provided by the TRDB, Moshi Branch, Kilimanjaro.

b. Extension

There is a definite need to improve the agricultural extension service of Tanzania if substantial increases in agricultural production are to be achieved. Among the deficiencies of the present service is the lack of staff, both in quantity and quality, as well as a lack of viable programs, field supervision and communication with the farmers.

The government has recognized the deficiency in trained manpower and has established a policy that calls for the assignment to each village of one agricultural extension worker in crops and one in livestock. The Ministry of Agriculture is making every effort to implement this policy throughout all of the regions by increasing the output of its training institutes, but the gap is large and will require some time for it to be substantially reduced.

The required staff expansion in the extension services to meet the government's policy can be seen in the various districts of the present study. For example, Dodoma region has a staff of 122 agricultural extension workers, of which 12 are in the Regional Headquarters, and 110 are stationed in villages of the four districts as follows:

	Dodoma Urban	Dodoma Rural	Mpwapwa	Kondoa	Total
No. of ext. workers	29	50	47	35	129
No. of villages	35	122	110	154	421
Ratio of ext. workers to villages	1:1.20	1:2.44	1:2.34	1:4.4	

Source: Office of the Regional Development Director, Dodoma Interim RIDEP, Volume III, January 1980, p. VII-64.

Total village requirements to achieve the policy goal of one agricultural extension person per village would thus be 421. This indicates that about 290 additional agricultural extension workers would be needed. During the past three years, however, an average of only 12 agricultural extension workers have been assigned to the region.[1/]

1/ Dodoma Interim RIDEP, Vol. III, p. VII-64.

An important consideration in the village coverage by extension agents is that in the nine districts of the three study regions, numbers of households per village range from about 300 to well over 600, with areas cultivated involving several hundred acres in many cases. Possibilities of direct personal contact with the farmers under the present situation are remote.

The national policy requirement applicable to the livestock portion of the extension service is that one Livestock Field Assistant (LFA) be assigned to each village. The LFA is a certificate holder after two years of training at an Agriculture Institute. Since there are only 46 Livestock Field Assistants in the Dodoma region, they can serve only about one-third of the total number of villages. To try and close the gap and thus provide some assistance to the bulk of the villages, crash courses are given in various basic aspects of livestock operation to students (primary school leavers) who have completed seven years of schooling. These persons are then employed as Livestock Field Attendants. Under the present circumstances, this stop gap measure is definitely worthwhile, but such persons cannot be considered as trained manpower.

In Singida region, a similar situation prevails. Iramba district, for example, has a total of 42 agricultural extension staff, including the District Agricultural Development Officer (DADO) and his small staff.[1/] Since there are 111 villages in the district, this means that the ratio of extension workers to villages is 1:2.78, and indicates that an additional 68 or so field staff are necessary to achieve a 1:1 ratio. Actually, the DADO reported that his staff is able to make contact (although not adequately in all cases) with about 75 villages during the year while the balance receive no help of any kind.

In the Manyoni district of Singida region, there are 13 agricultural agents for the 62 villages of the district, equivalent to a ratio of agents to villages of 1:4.68, while in the Mwanga district of Kilimanjaro region, there are 18 extension workers for the 47

1/ Data are from the Annual Report of the District Agricultural Development Officer, Kiomboi, Iramba, 2/29/1980.

villages, equivalent to a coverage ratio of 1:2.61.[1/]

The livestock extension service in Iramba has 115 staff members, but 56 of these staff members are Livestock Field Attendants, while in the Singida Rural district, 45 of the 118 livestock extension workers are Livestock Field Attendants. Of the 51 livestock extension agents in the Pare (Same and Mwanga) district in 1978, 19 were Livestock Field Attendants.

The consultant on Extension Service for the recently-issued Dodoma Interim RIDEP has recommended a series of actions for strengthening this service which is applicable not only to this region but to other regions as well. His recommendations are:

"(1) Provision of meaningful functions for the extension staff;
(2) In-service training;
(3) Work programming;
(4) Regular work supervision;
(5) Improvement of the existing incentive, discipline and staff placement systems; and
(6) Improvement of staff mobility by the provision of additional transport facilities." [2/]

A brief explanation of each of the recommendations follows:

--Under recommendation number (1), it is proposed that with the assistance of the Coordinator of RIDEP, a realistic work program being drawn up each year through the assistance of the Coordinator of RIDEP, the Regional Agricultural and District Development Officers and the staff. It would consist of a series of proven technical packages, and would be backed up with periodic and annual reviews identifying problems and progress and would incorporate such actual field data as hectares cultivated, and production (in contrast to the present estimates). Supervised field trials on farmers' plots would be an essential ingredient of the program.

--A regular in-service training program for all staff is contemplated under recommendation number (2) above. It would include a series of seminars for regional and district staffs, and training sessions in each district for the field workers.

1/ Data on extension workers in each of the districts were either provided directly by the DADO and DLDO or were obtained from their annual reports.

2/ See Vol. III, Working Papers, p. VI-66. The following discussion of these recommendations was summarized from pages VI-66-VI-71.

--The work program of recommendation (3) would include the drawing up of a representative sample of growers to be visited on a regular timetable. Through rotation of the sample yearly, it would insure the eventual coverage of all farmers.

--In view of the large size of the districts and the number of extension workers involved, the fourth recommendation calls for regular supervision of the field workers to be achieved through the establishment of supervisors at the ward level under the jurisdiction of the DADO. Each supervisor would cover about 8 wards, and for Dodoma region this would require about 12 supervisors. Ward visits would be made by the supervisor twice a month to each ward under his responsibility, while for the balance of the time he would be engaged in extension work.

--Recommendation number (5) encompasses suggestions to overcome the apparent lack of motivation on the part of many of the present extension staff. It is pointed out that the previous recommendations of an improved work program, in-service training, and supervision should help in motivating the personnel. In addition, it is recommended that redistribution of staff be made where inequitable situations are disclosed, such as with Dodoma Urban, which has proportionately more and better trained personnel than the other districts.

--The need for improvement of staff mobility, the last recommendation listed above, is one which this consultant encountered throughout his visits with the Regional and District Agricultural Officers of the three study regions. The RIDEP consultant recommends that four-wheel drive vehicles, lorries, motorcycles and bicycles be made available to increase the mobility of the existing staff. The motorcycles and bicycles would be financed by the workers with a government allowance currently in force to finance the operation.

An additional provision, not mentioned in connection with the above recommendation, is the need for an adequate allocation of funds to purchase gasoline for the vehicles. A number of the District Agricultural Development Officers visited by the consultant mentioned that they did not have sufficient funds to

purchase the gasoline to effectively carry out the necessary field work.

Another aspect of the recommendation of staff mobility not mentioned in the RIDEP report is that of the need to improve the rural access roads. All of the District Agricultural and Livestock Development Officers in the three study regions mentioned that the poor condition of the roads was an additional constraint which hampered their ability to utilize their existing staff more effectively in field work. Instances were also cited of inability to distribute hybrid seeds to certain villages because of bridges being washed out, or closing down of some livestock dips because of the inability to deliver the chemicals during certain periods of the rainy season was also mentioned.

Finally, this consultant encountered a number of instances during his field survey in which key agricultural officials (Regional and District Agricultural and Livestock Officers) had been transferred to their present posts only a few weeks or few months prior. In those cases, they had not had sufficient time to become acquainted with the agricultural situation in their areas of jurisdiction. In one district, for example, both the agricultural and the livestock development officers were new to their positions, as well as the branch manager for one of two parastatals serving the district. This constant shifting of key personnel among the regions and districts does little for continuity of programs or for achievement of results. The government should review its policy of key technical personnel transfers to determine whether or not it is being overdone.

c. Marketing and Pricing

(1) Crops

Crop procurement of most commodities in the three study regions (as well as throughout the country) is carried out by the government parastatals. The National Milling Corporation (NMC) is the only government procurement agency for six cereals (maize, paddy, rice, wheat, sorghum, bulrush millet and finger millet), cassava and beans. The General Agricultural Products Export Corporation (GAPEX) concentrates its crop

purchases upon the oilseeds, primarily castor seed, sunflower, sesame, and groundnuts, as well as small quantities of beeswax and gum arabic. A third government parastatal, Tanzania Cotton Authority, purchases all of the cotton grown in the three districts of Singida region, and Same and Mwanga districts of the Kilimanjaro region. Tobacco, grown in the Manyoni district of Singida region, is purchased by the Tobacco Authority of Tanzania, while coffee, a major crop of the Same and Mwanga districts of Kilimanjaro, is procured by the governmental parastatal, Tanganyika Coffee Board. A sixth crop procurement parastatal operating in the study area is the Tanzania Sisal Authority with responsibility for purchasing the sisal grown in the Same and Mwanga districts (as well as all other regions where sisal is grown).

A detailed analysis of the parastatal procurement by each agency for the study regions on the basis of individual crop tonnages by region, district and administrative divisions is contained in section 5.

Other crops such as fruits and vegetables are sold in small local markets, particularly in the towns containing the district and regional headquarters. In addition, not all of the tonnages of crops in which marketing is controlled by the parastatals is actually sold through these official channels. Among the controlled crops identified during the consultant's field survey as being sold to a less or greater extent outside official channels were maize, groundnuts, finger millet and cardamom.

The national trend of food crop purchases (the six cereals, cassava and beans) by NMC has been rapidly upward from their low point in 1974/75 (the drought years). In 1978/79, purchases of these crops totaled 485,000 tons compared with 226,000 tons in 1976/77 and about 85,000 tons in 1974/7 .[1/] Maize, which is the country's major subsistence crop as well as the major commercial food crop, accounted for much of the increase.

1/ Ministry of Agriculture, Price Policy Recommendations for the 1980-81 Agricultural Price Review, Annex 1 Cereals, Summary and Price Proposals, September 1979, p. 1.

The increases in production reflect favorable growing years, encouragement by the government to increase sorghum and millet production in the semi-arid areas, and significant increases in producers' prices.

Dodoma region provided 17 per cent of NMC's total maize procurement in 1978/79, while Mpwapwa district (the source of most of the region's maize with sales of about 31,000 tons in 1978/79), became the nation's most important maize district.

Marketed production of oilseeds representing purchases by GAPEX has also been up during the two most recent marketing years 1977/78 and 1978/79. Tonnages of about 17,400 and 22,800 were recorded for these two years respectively. In the previous four years, however, marketed production had declined significantly from about 19,900 tons in 1973/74 to 14,200 tons in 1976/77.[1/] The decline in the marketed production of oilseeds on a national basis is attributed to a growth in local consumption of groundnuts; greater emphasis on food crops and other cash crops; insufficient knowledge of oilseed husbandry in many areas and lack of extension services to promote oilseed production, and finally the low return to growers in comparison with competing food crops.[2/]

Procurement practices of NMC and GAPEX are essentially the same in the study regions, with a regional headquarters and main depot, along with branch offices at depots in the districts on a selected basis, since not all of the districts have depots.

The crops are purchased by NMC and GAPEX through the officials of the registered buying villages who act as agents for the parastatals. The village officials receive advances from the parastatals to pay for the crop purchases at the Announced Producer Price, and receive for the account of their villages a total payment of 9 cents per kilo from NMC (10 cents per kilo from GAPEX)[3/] to cover the handling, storage, admin-

1/ Ministry of Agriculture, Price Policy Recommendations, Annex 2 Oilseeds, September 1979, p. 5.

2/ Ibid., page 6.

3/ The higher payment by GAPEX reflects the higher-value cash crops compared to NMC's food crop purchases.

istration and other functions performed in the procurement process. This payment is known as the Village Development Levy.[1/] Transportation of the crops to depots is the responsibility of the procurement authorities (NMC and GAPEX). The authorities utilize their own limited trucking facilities supplemented by a large number of private operators as well as occasional equipment available from the Regional Trading Company (RTC), a transport parastatal. The private operators and RTC are engaged on a trip basis. The rate for an intra-regional haul for the account of NMC of a truckload of maize from Kondoa to Dodoma is T/shs 1.30 per ton-kilometer.[2/] The actual cost to NMC for each trip, however, is double the rate, since the charge is based upon both the outward haul and the return haul. For the above Kondoa to Dodoma truckload of maize, the freight costs would amount to T/shs 408 per ton based upon the distance of 157 kilometers and doubling of the T/shs 1.30 per ton-kilometer rate to reflect the round trip. When one considers that the current producer's price of maize (1980/81) is only T/shs 1,000 per ton, transport costs of 41 per cent are extremely high.

Some basic problems associated with motor carrier rate structure are that the rates do not reflect differences in the value of the goods being hauled. Other problems with this type of rate is that it does not reflect differences in road conditions or surface (paved, gravel or earth) nor does it make allowance for short hauls versus long hauls. The former are incurred at a higher cost, since the proportion of waiting time to running time is greater.

The truckers have recognized these deficiencies and on occasion have refused to go to certain areas if there has been much rain or will go only if the government will raise the rates. The truckers will also avoid wherever possible serving

1/ For additional details on the crop procurement, see M.A. Sackett, "Study on Agricultural Marketing," Dodoma Integrated Development Plan, Annex IV, September 20, 1979.
2/ Rate quoted by an official of the Regional Trading Company, Dodoma Branch Office, as of January 25, 1980.

villages which are located within a few miles of the depots.

Producer prices are fixed at the national level in Tanzania for 13 food crops and 11 export crops with price differentials within certain crops reflecting differences in grades and varieties (see Table V-8). Annual reviews are made each year based upon in-depth analyses of each crop by the Marketing Development Bureau, Ministry of Agriculture. The government announces the prices for these major crops (except for coffee, sisal and sugar) in the fall of the year prior to the new purchasing season. For example, prices for the 1980/81 purchasing season were announced in October 1979. The prices are uniform throughout mainland Tanzania.

Table V-8 shows that overall percentage increases for food crops ranged from 29 per cent to 110 per cent during the period 1975/76-1980/81, while for the export crops, the range was 50 per cent to 108 per cent, excluding cardamom, which is in a class by itself in terms of pricing.

(2) Livestock

The Tanzania Livestock Marketing Corporation (TLMC), a government parastatal, has the responsibility for the livestock marketing facilities throughout Tanzania. It also serves as an order buyer for the Army and the national livestock institutions. Auction markets are conducted by TLMC at 111 market locations in the three regions involved in this study as shown in the tabulation below:

Region & District	No. of Markets	Region & District	No. of Markets
Dodoma region		Singida region	
Dodoma Rural	22	Singida Rural	13
Dodoma Urban	6	Iramba	16
Mpwapwa	16	Manyoni	9
Kondoa	22	Total	38
Total	66		
Kilimanjaro region			
Mwanga & Same districts only	7		

Sales are conducted at the markets from twice a week to once every two to three months. Two markets in the study areas,

TABLE V-8

PRODUCERS' PRICES OF MAIN SCHEDULED CROPS FOR 1980/81 WITH HISTORICAL DATA TO 1975/76[1/]

Crop	Producer Price (Cents per kg.)						Overall Percentage Increase
	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	
Foodcrops							
Maize	75/80	80	85	85	100	100	29.0
Paddy	100	100	120	120	150	175	75.0
Wheat	100	120	125	125	135	165	65.0
Cassava - Makopa	40	50	60	65	65	65	62.5
- Udanga	38	40	50	50	50	50	31.6
Finger millet	80/85	95	200	200	200	150	81.8
Sorghum/bulrush millet	75	90	100	100	100	100	33.3
Groundnuts	200	250	400	400	400	420	110.0
Castor seed	75	75	100	100	100	120	60.0
Sunflower - Black	100	110	150	170	170	180	80.0
- Jupiter	100	110	150	150	150	160	60.0
- Other	75	80	125	130	140	150	100.0
Simsim (Sesame)	200	250	300	330	350	400	100.0
Copra	135-220	210-230	220-250	230	230	250	41.2
Export Crops							
Cotton - AR	200	200	230	240	300	320	60.0
- BR	100	100	115	120	130	150	50.0
Cashew nuts - SG	103	110	115	(135) 170[5/]	170	180	71.4
- UG	95	95	100	(125) 140[5/]	140	150	57.9
Tobacco - Flue	700	740	740	740	880	1,050	50.0
- Fire	300	450	520	520	625	625	108.0
- Burley	-	480	480	480	650	650	-
Tea (green leaf)[2/]	65	70	110	110	110	110	69.2
Pyrethrum - Gr. 1	650	650	650	650	750	1,100	100.0
- Gr. 2	550	550	550	600	700	950	72.7
- Gr. 3	421	421	421	500	650	850	101.9
- Gr. 4	400	400	400	460	600	750	87.5
- Gr. 5	-	-	-	-	550	650	-
Cardamoms - I	2,800	3,000	(3600) 5,000[4/]	(5000) 5,500[6/]	5,500	6,000	114.3
- II	2,100	2,100	(2600) 3,500[4/]	(3500) 5,000[6/]	5,000	5,000	138.1
- III	1,200	1,500	(1900) 2,500[4/]	(2500) 4,500[6/]	4,500	4,500	275.0

TABLE V-8

PRODUCERS' PRICES OF MAIN SCHEDULED CROPS FOR 1980/81 WITH HISTORICAL DATA TO 1975/76 1/

Crop	Producer Price (Cents per kg.)						Overall Percentage Increase
	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	
Export Crops (continued)							
Grapes	250	350	350	350	400	400	60.0
Beans 3/ - I	-	200	200-350	350	350	NA	-
- II	-	175	175-275	275	275	NA	-
Soybeans 3/	-	225	225	225	225	NA	-

1/ Excluded coffee and sisal since the prices had not been announced as of October 9, 1979.
2/ Price is net of input credit repayment (T/shs 0.40 per kg.).
3/ Prices for beans and soybeans announced by Ministry of Agriculture after consultation with NMC, no national prices prior to 1976/77.
4/ Effective June 1977, previous price shown in brackets.
5/ Effective October 1978, previous price shown in brackets.
6/ Effective May 1978, previous price shown in brackets.

Source: Marketing Development Bureau, Ministry of Agriculture, Producer Prices for the Main Scheduled Crops, 1972/73-1980/81, dated October 9, 1979.

one in Dodoma and the other in Same/Mwanga districts, sold no cattle during the past year. There were also a number of other markets during the past two to three years which were closed for varying periods ranging up to several months due to outbreaks of Hoof and Mouth Disease, Anthrax Disease, and cholera.

Fees are charged by TLMC for use of the market facilities which amount to T/shs 20 per head of cattle, and T/shs 4 per head of goats and sheep. The tabulation below of the amount of these fees collected by TLMC in Dodoma region during the years 1978 and 1979 shows that total fee income for 1979 was up about 9 per cent over the previous year with a volume of T/shs 729,000.[1/]

DATA ON MARKET SALES AND TOTAL FEE INCOME BY TLMC IN DODOMA REGION, 1978 & 1979

	No. Sales		Total Fee Income (T/shs)	
District	1978	1979	1978	1979
Dodoma Rural and Urban	249	211	376,714	344,896
Mpwapwa	156	152	84,680	90,184
Kondoa	192	176	206,848	294,350
Region Total	597	539	668,242	729,430

Source: Memorandum to Gen. Mgr., Tanzania Livestock Marketing Co., Ltd., P.O. Box 20669, Dar es Salaam, RE: Dodoma Area Markets Inc. Comparisons by H.F.D. Sahali, Zonal Mgr. Dodoma and H.A. Carpenter, LMA/TAMU/Dodoma.

The average number of head per sale were also somewhat larger in 1979 than in 1978 (T/shs 1,153 compared with T/shs 1,119). The combined districts of Dodoma Rural and Urban (not separated in data tabulations) accounted for 47 per cent of the total fee income in 1979, while Kondoa district contributed 40 per cent. In 1978, however, the share of the Dodoma Rural and Urban had been 47 per cent, and that of Kondoa, 31 per cent.

Nearly all of the livestock (cattle, goats and sheep) sold at the central markets are trekked from their home grazing areas.

1/ Similar data were not available for Singida region or the Same and Mwanga districts of Kilimanjaro.

Upon arrival at the market, the goats and sheep are separated from the cattle and sold in another part of the market. Once the cattle are sold they are branded with the new owner's brand, while the sheep and goats have an identifying mark put on with paint or red ochre. The livestock are then trekked to slaughter facilities in the villages or towns within the region, or if destined for movement outside the region, they are placed in holding grounds for two weeks under quarantine. They are then vaccinated against Blackwater Fever, Anthrax and Hoof and Mouth Disease, and are dipped to eliminate ticks and other insects. From the holding grounds, the cattle may then be trekked to the nearest rail loading point (where such facilities are available), or may be trekked long distances over stock trails or moved by truck to the ultimate destination. A qualification needs to be made, however, with regard to trekking of immature cattle, goats and sheep. In those instances where the trekking distances are long, some buyers will truck these animals from the markets to the ultimate destinations. The reason, of course, is that the smaller animals often times cannot stand the rigors of a long trek. For example, trekking of cattle to Arusha from Dodoma requires about 16 days, and even the mature cattle may lose substantial weight on these long treks.

In the Dodoma and Singida regions, which are two of the five regions with a surplus above regional requirements, cattle are used to supply Dar es Salaam, as well as other deficit regions such as Arusha, Tanga and Mbeya.

Most of the cattle moving from Dodoma to Singida regions to Dar es Salaam are shipped by rail. The rail service, however, leaves much to be desired. Livestock specialists in the field reported that shippers may often have to wait 30 days for the rail cars, in addition to the fact that during the trip shrinkage losses as high as 30 per cent and death losses of 16 per cent are common.

In contrast to the cattle shipments, the Dodoma Rural District Livestock Development Officer reports that most goats and sheep go to Dar es Salaam by truck.

Stock routes exist for trekking the cattle from Dodoma and Singida to Arusha, as well as routes for trekking from Dodoma to Tanga, and from Singida to Mbeya. There are also numerous stock routes for trekking cattle within the two regions. But cattle buyers have complained that in a number of instances the routes (established by TLMC) may not have been cleared, may not be close to villages where they can have a place to eat and sleep, and may lack sufficient water or grazing. In view of this situation, a number of the buyers will avoid the routes and move cross country. In addition to the recognized deficiencies in a number of the stock routes, the decision to bypass the routes may also be influenced that in this manner, the buyers can avoid paying stock route fees assessed by TLMC for maintaining the facilities.

On most occasions, active competitive bidding takes place at the TLMC marketing facilities between such participants as local butchers, butchers from other areas, traders from other areas and TLMC buying for the Dar es Salaam market, and national institutions.

TLMC's share of the livestock market has declined significantly over the past five years, according to industry specialists. Part of the decline has been due to the increasing sales outside the markets (direct sales to private traders).[1/] Another reason is that TLMC has fixed price contracts with the institutions for which it is buying. With the rapidly accelerating costs of transport and other marketing cost increases in recent years, it is forced to keep its bid prices at the market as low as possible. It is thus not competitive with private traders on a large share of the market (the better quality animals), and thus must settle for a smaller market share consisting of the poorer quality animals.

5. Production and Marketed Surplus

a. Introduction

1/ In the Mpwapwa district, goats are trucked directly to the Dar es Salaam market because of the higher prices being paid there compared with the regional market. Sales outside the market are not illegal at the present time (except for sales into Kenya), although there is some attempt to have them declared so.

Tanzania does not have a sound agricultural data base. Reliable statistics are not available on crop acreage or hectarage planted or harvested, production or yields at the national, regional, district or administrative division levels. Given the importance of agriculture in the national economy this is a serious handicap to the government and others when seeking to evaluate the sector in terms of its capability and constraints, progress or lack of progress, productivity and for general planning purposes. For example, the national Coffee Improvement Program, which began in 1977, was based upon estimates for the Kilimanjaro region of 28,000 hectares, and of 99,500 hectares for the entire national program. Subsequently in Phase I, which required an inventory of the coffee-growing areas, it was determined that Kilimanjaro region actually had about 55,000 hectares, and other regions additional hectares as well, with the result that the total for the country was revised upward to 172,148 hectares.[1/]

Experience of the consultant in the field revealed that baseline data for the agricultural sector (and others as well) are not maintained on a continuing basis at the regional or district offices. Although regional and district agricultural officers and their staffs were most cooperative in attempting to provide production data and/or acreage harvested by major crops for their particular district or region, in many instances the data prepared were of a fragmentary and limited nature with regard to coverage and comparability by areas, crops, years, production and yields.[2/] In most instances, the production and/or acreage and hectarage planted or harvested were based upon estimates by the staff. There is nothing inherently wrong with the estimation process, provided

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1/ Marketing Development Bureau, FAO/UNDP Project, Ministry of Agriculture, Annual Review of the Tanzania Coffee Industry, 1978, p. 10.

2/ The consultant received much valuable information from the regional and district agricultural and livestock development officers regarding the general agricultural situation in the specific areas including, among many others, types and varieties of crops, marketing and transport conditions, agricultural potential, herd sizes, offtake rates, cattle diseases and dips, etc. In all instances a staff member from either the staff of the District Agricultural Development Officer or the District Livestock Development Officer made himself available to accompany the consultant and arrange for the latter to interview officials of the parastatal marketing agencies, TRDB and other agencies.

that followup field work can be carried out to review and revise the estimates on the basis of hard data. The problem in Tanzania is that the agricultural regional and district offices do not have sufficient manpower, transport vehicles, or funds to operate them in order to carry out adequate followup work in the field.[1/] Poor road conditions were also mentioned as an additional obstacle to the followup work.

A further complicating factor which tends to increase the burden of the agricultural statistics followup work is the fact that so much of the food crop production is of a subsistence nature with consumption taking place on the smallholder farm. Statistics on this type of production are difficult to obtain, since the commodities do not enter the marketplace, where sales records are generally maintained. Even when commodities are sold, however, it does not necessarily mean sales records are always available. Reportedly a substantial percentage of the total sales of agricultural food and cash crops in Tanzania are sold through private channels with no record of the sales.

Another facet of the statistical problem is the absence of an agricultural crop census. Data from such a census, if conducted properly and published on a timely basis, would permit the establishment for the first time of a firm base which would show the present status of agriculture. It would also permit meaningful comparisons to be made in the future on the basis of additional special surveys and censuses. Although an agricultural census was conducted in 1971, partial results of data nearly ten years old are just now being readied for publication. Data that old are not very useful in evaluating the present-day Tanzanian agricultural economy.

Given the above situation regarding the status of agricultural statistics (with similar situations to be found in the other economic sectors, small industry, forestry fishing, etc.--see sec. C., Part V), the consultant is recommending that a base line data system be established on a continuing basis so that reliable statistics can be available for purposes of improved planning, feasibility studies, monitoring and evaluating projects after they have been implemented, and for other worthwhile purposes. See Part I.B.

1/ For further discussion of the extension staff, see 3.a. of this section.

One bright spot on the horizon in the form of improved agricultural statistics is that of the 1978 Livestock Count in mainland Tanzania. Although this Livestock Census encountered numerous problems which necessitated rescheduling and thus required a relatively long time span to complete the count, the census is generally regarded as one of the best nationwide counts carried out for many years.[1/] The prolonged time period in carrying out the count probably compounded the error associated with census data since some cattle may have been double counted or missed completely through movements during the lengthy period. But in spite of this, the results are perceived as being safely useable for planning purposes.[2/] Data from this census were provided to the consultant by each of the District Livestock Officers in the study areas.[3/]

In the absence of firm production data, the Ministry of Agriculture (KILIMO) publishes estimates of annual crop production for a number of the major crops on a regional basis. Since the crop production data are estimates they need to be treated in that vein.

b. Food and Cash Crops

(1) Estimated Production

Given the above caveat, estimates of major crop production are shown in Table V-9 for the Dodoma and Singida regions for the period 1974/75 through 1977/78. Although 1973/75 were disastrous drought years for agriculture throughout Tanzania, and especially for the Dodoma and Singida regions with their semi-arid climatic characteristics,[4/] the data in Table V-9 show this impact to have been especially strong only in 1973/74, while for the two remaining years the pattern is so mixed that it raises some question about the estimates. For example, the

1/ Ministry of Agriculture, The 1978 Livestock Count in Mainland Tanzania and Beef Demand and Supply Study, September 1970, p. 20.
2/ Ibid.
3/ No production estimates are shown for Same and Mwanga districts, since the Bulletin of Food Crop Statistics contains only regional estimates by crops. Although the consultant was provided with production estimates for the two districts while in the field, the unexplained inconsistencies in the data prevented their use.
4/ While on field interviews in Singida, officials revealed that the large salt water lake near Singida town had completely dried up during the drought and that the townspeople were digging up the salt from the lake bottom for home and commercial use.

TABLE V-9
ESTIMATED MAJOR CROP PRODUCTION OF DODOMA AND SINGIDA REGIONS, 1973/74 THROUGH 1977/78
(METRIC TONS)

Region and Crop	Years					Five Year Average
	1973/74	1974/75	1975/76	1976/77	1977/78	
Dodoma						
Maize	32,000	60,000	43,946	23,900	63,546	46,879
Sorghum	24,000	47,500	58,099	45,200	131,646	61,289
Millets	15,000	22,213	44,750	72,280	118,171	54,483
Cassava dry	690	703	1,380	480	8,569*	2,104
Sweet potatoes	1,850	950	1,131	3,950	3,950	2,366
Mixed beans	1,200	200	615	400	600	603
*Raw cassava						
Singida						
Maize	5,600	15,248	17,550	13,780	18,961	14,227
Sorghum	29,314	42,575	40,887	40,405	63,253	43,287
Millets	20,098	23,717	19,900	26,998	52,566	28,656
Cassava dry	3,901	3,928	4,321	4,321	5,757	4,445
Sweet potatoes	22,080	17,807	21,000	21,200	2,829	17,023
Mixed beans	141	296	129	120	8	138

Source: Bulletin of Food Crop Production Statistics, 1963/64-1977/78, Statistics Section, Planning Division, Ministry of Agriculture, Dar es Salaam, April 1979.

estimate of maize production in 1974/75 of 60,000 tons for the Dodoma region is shown to have been exceeded only by the 1977/78 year. But NMC purchases of cereals including maize in Dodoma region during 1974/75 were zero, and in 1975/76 only 6,000 tons, while in 1977/78 purchases of maize amounted to nearly 18,000 tons or about 8 per cent of all NMC maize purchases for that year

For the last two years of the data (1976/77 and 1977/78), estimates of rising cereal production in the two regions coincides with the generally favorable rainfall which has prevailed. Favorable rainfall conditions were also experienced in the 1978/79 crop year, with the result that NMC cereal purchases in both Dodoma and Singida regions were at record-high levels. This is especially so in the case of the Dodoma region. Estimates of food crop production and of data on marketed food crops through December 31, 1979 indicate that the 1979/80 food crop production in Dodoma and Singida regions should be reasonably good although well below the 1978/79 season. The early season rains of 1979/80 were late in coming to the Dodoma and Singida regions, with the result that in certain areas, early maize plantings were lost. Additional crop loss also occurred as the result of heavy flooding in parts of Dodoma region during March 1980.[1/]

(2) Marketed Surplus

(a) Dodoma region

Within Dodoma region, Mpwapwa district is the major source of the region's marketed surplus of food crops, as shown in Table V-10.[2/] Over the three-year period 1977/78 through 1979/80 Mpwapwa accounted for about 56 per cent of the region's marketed food crop tonnage. It

1/ It is also interesting to note that despite the highly favorable crop year of 1978/79 in Dodoma and Singida regions, portions of Manyoni and Iramba districts in Singida region received excessive rains which washed out crops, bridges and road segments.
2/ Marketed surplus for both food and cash crops as used in this study refers to purchases of these crops by the parastatal marketing agencies. Data are not available on the quantity of clandestine or other private trading which goes on in the region, although conversations with various officials and other knowledgeable persons indicate it might represent at least 20 per cent of the region's total.

TABLE V-10
MARKETED FOOD AND CASH CROPS, DODOMA REGION BY DISTRICTS,
1977/78, 1978/79, AND 1979/80
(METRIC TONS)

District	Food Crops 1977/78	1978/79	1979/80 1/	Three Year Average 2/
Dodoma Rural	2,341	6,235	3,508	4,145
Dodoma Urban	108	509	182	277
Mpwapwa	28,447	44,241	19,889	31,523
Kondoa	15,683	26,895	17,138	20,498
Region total or avg.	46,579	77,880	40,717	56,443

District	Cash Crops 1977/78	1978/79	1979/80 3/	Three Year Average 4/
Dodoma Rural	231	179	407	297
Dodoma Urban	4	37	34	26
Mpwapwa	1,335	1,639 5/	2,556	1,886
Kondoa	1,644	2,361	1,723	1,938
Region total or avg.	3,214	4,216	4,720	4,147

1/ Data are from July through December 1979, and are estimated by NMC local officials as 90 per cent of year's total.
2/ Reflects an upward adjustment of 10 per cent in the 1979/80 total.
3/ Data are from July through December 1979, and are estimated by GAPEX local officials as 95 per cent of year's total.
4/ Reflects an upward adjustment of 5 per cent in the 1979/80 total.
5/ Data were not made available for this particular year. Calculated as the residual from the regional total.

Source: Summary of Tables A-V-1 through A-V-8, representing purchases by NMC and GAPEX. Commercial sales of grapes in Dodoma Urban and Dodoma Rural are shown separately.

was followed by Kondoa with 36 per cent of the crop tonnage, while Dodoma Rural and Urban combined accounted for the remaining 8 per cent. Both Mpwapwa and Kondoa have areas of greater rainfall and general soil fertility compared with Dodoma Rural and Dodoma Urban.

The above marketed food crop production for Dodoma region, representing purchases by the National Milling Corporation, consists primarily of the cereals--maize, sorghum, bulrush millet and finger millet.[1/]

A variety of vegetables and some fruits are produced in the Dodoma region, largely in the upland areas of Mpwapwa and Kondoa districts, although tomatoes are grown throughout the region. Most of this present production is either sold within the local village or consumed by the producers. With expansion of the new capital at Dodoma, a rapidly-growing demand is anticipated for fruits and vegetables which in turn is expected to stimulate production of these commodities for commercial sales.

At the division level of marketed food crop production, the seven top divisions accounted for 75 per cent of the region's recorded marketed surplus, averaged out over the period 1977/78-1979/80 (Table V-5). They included four divisions in Mpwapwa district (Zoissa, Mlali, Kibakwe and Kongwa in order of rank), and three in Kondoa district (Bereko, Pahi and Mondo in order of rank). These divisions are areas with total annual rainfall of over 559 millimeters with a 70 per cent probability--high rainfall areas for the Dodoma region (see Table V-11).

Cash crops marketed in Dodoma region averaged about 4,100 tons over the three-year period 1977/78-1979/80 (Table V-10). As with the food crops, Mpwapwa and Kondoa dominated the cash crop marketings. The marketings represent purchases by the General Agricultural Products Export Corporation (GAPEX) and National Milling Corporation (NMC), and consist primarily of oilseeds (groundnuts, castor seed, sunflower and sesame).[2/]

1/ See Appendix Tables A-V-1 through A-V-4 for details of food crop purchases by NMC for Dodoma region including major crops, districts and divisions for recent years.
2/ See Appendix Tables A-V-5 through A-V-8.

FOOD CROP PURCHASES, DODOMA REGION, BY ADMINISTRATIVE DIVISION, AVERAGE OF THE YEARS 1977/78-1979/80[1]
(METRIC TONS)

District and Division	Amount	District and Division	Amount
Dodoma Rural		Dodoma Urban	
Itiso	1,432	Hombolo	145
Chamwino	845	Kikombo	79
Mvumi	400	Nala	14
Mwitikira	206	Mpunguzi	39
Chipanga	211		
Bahi	72		
Makangwa	817		
Mundemu	162		
District Average	4,145	District Average	277
Mpwapwa		Kondoa	
Mpwapwa	2,321	Kondoa	875
Kibakwe	5,435	Mondo	4,309
Mlali	8,077	Farkwa	45
Zoissa	10,617	Kwamtoro	62
Kongwa	4,064	Pahi	4,573
Rudi	1,009	Goima	3,839
		Bereko	5,148
		Kolo	1,647
District Average	31,523	District Average	20,498

1/ Data for 1979/80 are adjusted upward by 10 per cent to reflect the estimated tonnage for the full year.

Source: Computed from Appendix Tables A-V-1 through A-V-4 in addition to the adjustment noted in footnote above. Original data were compiled from records of the National Milling Corporation, Dodoma Branch.

In addition, relatively small amounts of beeswax and gum arabic are purchased by GAPEX in the Dodoma region. Cash crop purchases are shown on a division basis in Table V-12, with the largest purchases being made in Mlali, Kongwa, Mpwapwa and Kibakwe divisions in the Mpwapwa district and in Pahi in the Kondoa district.

Another cash crop of particular importance to the Dodoma Urban and Rural districts is that of grapes grown largely for sale to the winery in Dodoma, although local sales of fresh grapes are made and small quantities are consumed by the producers. For example, data for the Dodoma Rural district showed that total sales represented about 83 per cent of production during 1978 and 1979.[1/]

Marketed production of the two districts has been running about 400 tons since 1977, with an approximate even split between the two. The major producers at the division level are Mpunguzi in Dodoma Urban and Mvumi and Mundemu in Dodoma Rural, although some grape production and sales occurred within all divisions of the two districts.

Substantial expansion is anticipated in this crop with construction of the new winery just north of Dodoma (which will be double the capacity of the present plant), and with increased market demand for fresh grapes anticipated with the rapidly growing population of the new capital at Dodoma.

Marketed production of grapes is included within the cash crop sales as part of the input for determining the rural access road priorities by divisions.

(b) Singida Region

The volume of marketed food crops for the entire Singida region over the past two crop years (1978/79 and 1979/80), averaging just over 5,000 tons, is about the same order of magnitude as that of the Dodoma Rural district for the same periods (see Tables V-10 and V-13). Food production throughout the region is thus largely on a subsistence basis, with a surplus available only when there has been an adequate and reasonably well-distrib-

1/ Information provided by the Agricultural Development Officer, Dodoma Rural District.

TABLE V-12
CASH CROP PURCHASES, DODOMA REGION, BY ADMINISTRATIVE DIVISION, AVERAGE OF THE YEARS 1977/78-1979/80 1/
(METRIC TONS)

District and Division	Amount	District and Division	Amount
Dodoma Rural		Dodoma Urban	
Itiso	34	Hombolo	21
Chamwino	83	Kikombo	2
Mvumi	47	Nala	2
Mwitikira	10	Mpunguzi	1
Chipanga	43		
Bahi	8		
Makangwa	43		
Mundemu	29		
District Average	297	District Average	26
Mpwapwa		Kondoa	
Mpwapwa 2/	330	Kondoa	141
Kibakwe	247	Mondo	811
Mlali	577	Farkwa	1
Zoissa	162	Kwamtoro	5
Kongwa	534	Pahi	565
Rudi	160	Goima	77
		Bereko	166
		Kolo	172
District Average	2,010	District Average	811

1/ Data for 1979/80 are adjusted upward by 5 per cent to reflect the estimated tonnage for the full year.
2/ Data are for two years only, 1977/78 and 1979/80. Data for 1978/79 were not available.

Source: Computed from Appendix Tables A-V-5 through A-V-8, in addition to the adjustment noted in footnote 1/ above. Original data were compiled from records of both GAPEX and NMC branch offices in the Dodoma Region.

uted rainfall throughout the growing season. This was generally the case in the past two years. Even under relatively favorable conditions, the surplus is small. As can be seen from Table V-7, Singida Rural district accounted for about two-thirds of the surplus during the two-year period.

Maize, sorghum and bulrush millet are the major contributors to the marketed surplus, with finger millet, cowpeas, pigeon peas and beans of minor importance (see Appendix Tables A-V-9 through A-V-11).

The major sources of the food crop purchases at the administrative division level were Ilongero and Mtinko in Singida Rural, Nduguti in Iramba, and Nkonko in Manyoni district (Table V-14). Purchases from these four divisions averaged about 72 per cent of the region's two-year total. Five additional divisions (Mgori, Kinvangiri, Ihanja, Itigi and Mungaa) accounted for an additional 18 per cent of the two-year total, while the 10 per cent balance was distributed among the nine remaining divisions.

Over the past two years, cash crop purchases by the National Milling Corporation for the Singida region averaged about 1,900 metric tons (Table V-13). This is approximately one-third the quantity of the food crop purchases for the same period. Iramba district accounted for nearly 90 per cent of the cash crop tonnage. Sunflower is the dominant oilseed crop, accounting for about 95 per cent of the cash crop tonnage. Other minor oilseed crop purchases were groundnuts, castor seed and sesame.[1/]

Origin of the cash crop purchases by administrative division shows that Nduguti is by far the major producer, averaging over 900 tons, nearly one-half of the entire region's total in the past two years (Table V-15). Other divisions with purchases in excess of 100 tons were Kinampanda, Kinyangiri, Kirumi and Ndago--all in Iramba district.

Cotton is an additional cash crop of substantial importance to the Singida region. Purchases by the Tanzania Cotton Authority averaged over 800 tons during the period 1977/78 through 1979/80

1/ See Apperdix Tables A-V-12 through A-V-14.

TABLE V-13
MARKETED FOOD AND CASH CROPS, SINGIDA REGION BY DISTRICTS, 1978/79 AND 1979/80
(METRIC TONS)

District	Food Crops 1978/79	1979/80 1/	Average 2/
Singida Rural	4,409	2,211	3,422
Iramba	1,802	622	1,244
Manyoni	979	273	640
Region total or average	7,190	3,106	5,306

District	Cash Crops 1978/79	1979/80 3/	Average 4/
Singida Rural	97	293	200
Iramba	790	2,383	1,646
Manyoni	22	25	24
Region total or average	909	2,701	1,870

1/ Data are from June through December 31, 1979, and are estimated by NMC local officials as 90 per cent of year's total.
2/ Reflects an upward adjustment of 10 per cent in the 1979/80 total.
3/ Data are from June through December 31, 1979, and are estimated by NMC local officials as 95 per cent of year's total.
4/ Reflects an upward adjustment of 5 per cent in the 1979/80 total.

Source: Summary of Appendix Tables A-V-9 through A-V-14 representing purchases by NMC of both food and cash crops. Purchases of tobacco and cotton are shown separately.

TABLE V-14
FOOD CROP PURCHASES, SINGIDA REGION, BY ADMINISTRATIVE DIVISION, AVERAGE OF THE YEARS 1978/79 AND 1979/80 1/
(METRIC TONS)

District and Division	Amount	District and Division	Amount
Singida Rural		Iramba	
Ihanja	179	Kirumi	58
Ikungi	232	Nduguti	81.2
Mungaa	167	Kinyangiri	191
Mtinko	926	Kinampanda	52
Mgori	258	Kisiriri	29
Ilongero	1,660	Ndago	87
		Shelui	15
District Average	3,422	District Average	1,244
Manyoni			
Manyoni	-		
Itigi	176		
Manyoni Vijijini	-		
Kintinku	24		
Nkonko	440		
District Average	640		

1/ Data for 1977/78 were not available. Data for 1979/80 are adjusted upward by 10 per cent to reflect the estimated tonnage for the full year.

Source: Computed from Appendix Tables A-V-9 through A-V-11 in addition to the adjustment noted in footnote above. Original data were compiled from records of the National Milling Corporation, Singida Branch.

TABLE V-15
CASH CROP PURCHASES, SINGIDA REGION, BY ADMINISTRATIVE DIVISION, AVERAGE OF THE YEARS 1978/79 AND 1979/80 1/
(METRIC TONS)

District and Division	Amount	District and Division	Amount
Singida Rural		Iramba	
Ihanja	24	Kirumi	154
Ikungi	28	Nduguti	912
Mungaa	32	Kinyangiri	174
Mtinko	72	Kinampanda	228
Mgori	22	Kisiriri	36
Ilongero	22	Ndago	130
		Shelui	12
District Average	200	District Average	1,646
Manyoni			
Manyoni	15		
Itigi	-		
Manyoni Vijijini	-		
Kintinku	3		
Nkonko	6		
District Average	24		

1/ Data for 1977/78 were not available. Data for 1979/80 are adjusted upward by 5 per cent to reflect the estimated tonnage for the full year.

Source: Computed from Appendix Tables A-V-12 through A-V-14 in addition to the adjustment noted in footnote above. Original data were compiled from records of the National Milling Corporation, Singida Branch.

(Table V-16). Although this is a relatively short period of years, the data show a downtrend in production, even though these years have been on the whole normal or better than normal in terms of rainfall. TCA field officials attribute the downturn to late planting, poor weeding and spraying practices.

Iramba district is the major producer of cotton in Singida region with most of the production centered in Shelui division. The next two leading divisions are Ilongero in Singida Rural district and Kinampanda in Iramba district. Although cotton is grown in an additional nine divisions in the region, the amounts are very small, ranging from 56 tons down to 2 tons (Table V-16).

Tobacco is grown as a cash crop in Singida region, although the production occurs only in a few villages in Itigi division. Marketed production was 215 tons in 1976/77 and 332 tons in 1977/78. These data are included in the input matrix for this division in the road priority selection.

(c) Same and Mwanga Districts, Kilimanjaro

The Same and Mwanga districts of the Kilimanjaro region produce only a very small surplus in their food crops (Table V-17). Climate and soil conditions are not conducive to the production of the cereal crops such as maize and sorghum above the subsistence needs of the growers. In view of this situation, these two districts of the region are not included in the National Food and Credit Program, which provides short-term loans for the purchase of maize, hybrid seeds, fertilizers, and pesticides. As a subsistence crop, however, maize is the mainstay of the farm diets in both districts, with about 55,000 acres cultivated in the two districts combined. As insurance against poor crop years of maize, cassava is also cultivated in these areas, since it can grow in poor soils, is drought-resistant, and can be left in the ground for harvest at any time.

Bananas are also a source of food supply for the local populations of Same and Mwanga. Production comes from the plants which serve as shade for the coffee trees in the North and South Pare Mountains.

TABLE V-16
COTTON PURCHASES IN THE SINGIDA REGION, BY DISTRICT AND ADMINISTRATIVE DIVISION, 1977/78, 1978/79 AND 1979/80
(METRIC TONS)

District and Division	1977/78	1978/79	1979/80 1/	Average
Singida Rural				
Ihanja	2	2/	2	2
Ikungi	-	-	-	-
Mungaa	47	43	78	56
Mtinko	16	22	2	13
Mgori	42	9	1	17
Ilongero	226	78	46	117
District total or avg.	333	152	129	205
Iramba				
Kirumi	44	43	46	44
Nduguti	46	17	16	26
Kinyangiri	76	112	86	91
Kinampanda	-	-	-	-
Kisiriri	-	-	-	-
Ndago	53	29	65	49
Shelui	553	283	242	359
District total or avg.	772	484	455	569
Manyoni				
Manyoni	-	-	-	-
Itigi	39	62	32	44
Manyoni Vijijini	-	-	-	-
Kintinku	-	-	-	-
Nkonko	-	-	8	3
District total or avg.	39	62	40	47
Region total or avg.	1,144	698	624	822

1/ Data are from July 1 through December 31, 1979. Estimated by TCA officials as the full crop year purchases.
2/ Less than 0.5 metric tons.

Source: Tanzania Cotton Authority, Iramba Branch.

Sugar cane is another crop grown quite extensively throughout the mountainous areas of Same and Mwanga districts. Many producers throughout the areas have 1/4 to 1/3 acre plots planted in sugar cane. The cane is not processed into sugar, however, but is used primarily for the making of a local liquor referred to as "native beer."

The food crop purchases by NMC, shown in Table V-17, are primarily paddy, rice, beans and cowpeas, with most of the production centered in the two Same district divisions of Gonja and Mwembe/Mbaga. A portion of these crops is also consumed by the producers.

Production of oilseed cash crops representing purchases by GAPEX in the Same/Mwanga districts are extremely small, totaling less than 100 tons for both districts (Table V-18). In terms of value, however, these crops, consisting largely of cardamom, castor seed and sunflower seed, are not insignificant as shown in section c. Marketing and Pricing.

Cocton and coffee are two cash crops of substantial importance to growers in the Same/Mwanga districts. Cotton purchases by the Tanzanian Cotton Authority averaged about 400 tons in the 1976/77 and 1978/79 crop years, while in the Mwanga district they averaged about 70 tons (Table V-19). Among the divisions, home/Suji is the main producer, accounting for about 60 per cent of the cotton purchases in the Same district for the two crop years. During this period, nine of the ten divisions in the two districts had some cotton purchases although the amounts did not exceed 80 tons for any one division (excluding Chome/Suji) (Table V-19).

Coffee purchases by the Tanganyika Coffee Board averaged nearly 700 metric tons in the two districts of Same and Mwanga during the three-year period 1976/77-1978/79, as shown in the tabulation below. Purchases (and production), however, were confined to only three divisions: Mwembe/Mbaga and Gonja in Same district; and Lawene in the Mwanga district. There has been a sharp fall-off in production in each of the three divisions over the three-year period. Coffee production in the

TABLE V-17
FOOD CROP PURCHASES, SAME AND MWANGA DISTRICTS, KILIMANJARO REGION, BY ADMINISTRATIVE DIVISION, AVERAGE OF THE YEARS 1977/78 THROUGH 1979/80 1/
(METRIC TONS)

District and Division	Amount	District and Division	Amount
Same		Mwanga	
Same	60	Ugweno	75
Mwembe Mbaga	411	Usangi	99
Gonja	597	Mwanga	52
Chome/Suji	140	Lembeni	86
Mamba Vunta	2/		
Ndungu	224		
District average	1,432	District Average	312

1/ Data for 1979/80 are adjusted upward by 10 per cent to reflect the estimated tonnage for the full year.
2/ Less than 0.5 metric tons.

Source: Computed from Appendix Tables A-V-15 through A-V-18 in addition to the adjustment noted in footnote 1/ above. Original data were compiled from records of the National Milling Corporation, Moshi Branch, Kilimanjaro.

TABLE V-18
CASH CROP PURCHASES, SAME AND MWANGA DISTRICTS, KILIMANJARO REGION, BY ADMINISTRATIVE DIVISION, AVERAGE OF THE YEARS 1976/77 THROUGH 1978/79 1/
(METRIC TONS)

District and Division	Amount	District and Division	Amount
Same		Mwanga	
Same	25	Ugweno	15
Mwembe Mbaga	1	Usangi	4
Gonja	19	Mwanga	-
Chome/Suji	4	Lembeni	7
Mamba Vunta	4		
Ndungu	-		
District average	53	District average	26

1/ Data were not available for 1979/80, thus 1976/77 was substituted to obtain a three-year average.

Source: Computed from Appendix Tables A-V-17 and A-V-18. Original data were compiled from records of the General Agricultural Products Export Corporation (GAPEX), Same Branch, Kilimanjaro.

District and Division	Coffee Purchases (Metric Tons) 1976/77	1977/78	1978/79	Average
Same				
Mwembe/Mbaga	189	110	128	142
Gonja	448	98	90	212
Total	637	208	218	354
Mwanga				
Ugweno	459	300	256	338
Combined Totals	1,096	508	474	693

Source: Data compiled from records of Tanganyika Coffee Board, Moshi Branch.

entire Kilimanjaro region, the country's main coffee producing region, is reported to have remained stagnant with production fluctuating between 20,000 to 30,000 tons since the mid-1960s.[1/] Other major coffee producing regions have also been experiencing largely stagnant production. In view of this situation, the government has initiated programs to increase production through disease control, improved crop husbandry, and increased acreage.[2/]

A final major cash crop grown in the Same/Mwanga districts is sisal. Production has averaged about 450 tons over the period 1977-1979, although the trend has been definitely downward (Table V-20). The combined production of the two districts has been running between 65 to 70 per cent of total production in Kilimanjaro region during the 1977-79 period. About 70 per cent of the production is concentrated in Ugweno division, while the other major share is grown in Gonja division.

The crop is grown on five estates in the two districts, of which four are operated by the Tanzania Sisal Authority, a government parastatal, and the fifth estate is private. Three of the five estates, including the private one, are reported to be in good condition, while the other two are being rehabilitated after years of minimum activity. Sisal is used for making rugs

1/ See Market Development Bureau, FAO/UNDP Project SF TAN 27, Ministry of Agriculture, Annual Review of the Tanzania Coffee Industry, 1978, March 1979.
2/ Market Development Bureau, Annual Review, March 1979.

TABLE V-19
COTTON PURCHASES BY TANZANIAN COTTON AUTHORITY, SAME AND MWANGA DISTRICTS, KILIMANJARO REGION, BY ADMINISTRATIVE DIVISION, 1976/77 AND 1978/79
(METRIC TONS)

District and Division	1976/77	1978/79	Average
Same			
Same	114	47	80
Mwembe Mbaga	17	38	28
Gonja	2	-	1
Chome/Suji	207	284	246
Mamba Vunta	-	-	-
Ndungu	62	38	50
Total	402	407	405
Mwanga			
Ugweno	26	7	16
Usangi	33	15	24
Mwanga	23	18	20
Lembeni	17	2	10
Total	99	42	70
Combined Totals	501	449	475

Source: Data compiled from records of Tanzania Cotton Authority, Moshi Branch, Kilimanjaro region.

TABLE V-20
SISAL PRODUCTION IN THE MWANGA AND SAME DISTRICTS, KILIMANJARO REGION, 1977, 1978 AND 1979 (METRIC TONS)

Division	1977	1978	1979 1/	Average
Mwanga				
Ugweno	1,243	1,040	713	999
Total Mwanga	1,243	1,040	713	999
Same				
Mwembe Mbaga	90	75	51	72
Gonja	469	392	269	377
Total Same	559	467	320	449
Total or average Mwanga and Same	1,802	1,507	1,033	1,448

1/ Estimated from data for nine months of 1979, based upon average of previous two years for the same periods.

Source: Tanzania Sisal Authority, Production Performance Report for 1978 on TSA Estates, and from Agricultural Development Officers, Same and Mwanga districts.

and carpets, and also for bags for coffee, maize, paddy, legumes and other commodities.

c. Livestock

(1) Introduction

The livestock sub-sector of agriculture contributes about 12.5 per cent of the GDP, or about one-third of the total agricultural sector contribution. It is a major source of income and of food supply to a large percentage of the population throughout the country and within the study regions, especially with regard to Dodoma and Singida regions. Both Dodoma and Singida are major exporters of cattle to other regions, and the nation is beginning to develop an export meat industry. The tabulation below indicates the relative importance of the three study areas to the nation's livestock population in 1978.

STUDY AREA LIVESTOCK POPULATIONS AS PERCENTAGE OF NATIONAL TOTALS, 1978

Study Areas	Cattle	Goats	Sheep
Dodoma	9.2	10.8	8.4
Singida	6.5	7.6	6.7
Same/Mwanga districts	1.7	3.7	3.0

Source: Computed from data in Ministry of Agriculture, The 1978 Livestock Count in Mainland Tanzania and Beef Demand and Supply Study, September 1979, and data supplied to the consultant by the Regional and District Livestock Officers for each of the study areas.

(2) Livestock Population

(a) Historical Trends--Cattle

According to the Livestock Population Census of 1978, the nation's cattle population totaled about 12.0 million head.[1/] This compares with about 6.5 million head in 1954, the only other year in which there has been an official count. Cattle populations given for intervening years between the 1954 and 1978 counts are estimates. The annual average growth rate between 1954 and 1978 is 2.2 per cent.

1/ Ministry of Agriculture, The 1978 Livestock Count in Mainland Tanzania and Beef Demand and Supply Study, September 1979, p. 26, Table I.

This rate, less than the population growth rate for the same period, reflects the drought years of 1973-75 when herds were greatly depleted both from increased marketings because of lack of pasture and from deaths due to starvation. In recent years, the herds have been in a replenishing stage.

Cattle population census data for 1954 and 1978 (with estimates for intervening years for the study areas) show cattle numbers for Dodoma region nearly doubling over the 28-year period (1954-1978), while those for Singida region increased by about two and one-third times (Table V-21). For the Same/Mwanga districts (formerly Pare), the increase was nearly two and one-half times. The annual average growth rates for the three study areas during this 28-year period were as follows:

Dodoma region -- 2.3
Singida region -- 3.1
Same/Mwanga districts -- 3.2

The annual average growth rates for all three study areas are above the national average (2.2 per cent).

Historical trends in cattle population by districts within the two regions, Dodoma and Singida, show that Mwapwa district had the highest annual average rate (2.8 per cent) and Kondoa district the lowest (1.7 per cent) (Table V-21). The low rate for Kondoa probably reflects the recent movement of cattle out of the badly-eroded areas. In the Singida region, Singida Rural has a rate of nearly 4 per cent, the highest of any of the districts in the two regions. In contrast, Manyoni district has only 1.1 per cent, the lowest annual average rate within both regions. Comparable historical trend data at the national, regional, district or administrative division levels are not available for goats and sheep.

(b) Regional, District and Division Comparisons--1978 Livestock Census

Comparisons among the study areas by actual numbers of head in 1978 show Dodoma with 1.1 million cattle, lead-

TABLE V-21

CATTLE POPULATION CENSUS DATA AND ESTIMATES FOR THE STUDY REGIONS, 1954 TO 1978[1/]

Region and District	1954	1964[2/]	1965	1967	1972	1977	1978[3/]	Average Annual Growth Rate (%) 1954-1978
Dodoma								
Dodoma Rural and Urban	324,597	641,400	540,000	650,300	400,000	485,400	620,500	2.4
Mpwapwa	106,232	226,600	188,300	158,700	182,800	216,400	230,600	2.8
Kondoa	159,347	214,200	315,000	390,100	319,500	349,200	252,000	1.7
Total or average	590,176	1,082,200	1,043,300	1,198,800	902,300	1,051,000	1,103,100	2.3
Singida								
Singida Rural	116,191	230,000	220,300	210,300	NA	NA	338,800	3.9
Iramba	132,710	266,000	253,000	287,000	NA	NA	328,300	3.3
Manyoni	82,993	170,000	147,600	178,900	NA	NA	111,700	1.1
Total or average	331,894	666,000	620,900	676,200			778,800	3.1
Kilimanjaro (Pare district)								
Same and Mwanga	84,978	130,000	130,000	NA	(1970) 106,300	(1975) 188,800	206,900	3.2

1/ Census data are for 1954 and 1978. The intervening years represent rounded estimates from various studies as quoted in an unpublished report by K.W. Stokes, Livestock Economist, Texas A & M University, and Tanzania Livestock Marketing Company.

2/ Average of two different estimates for 1964.

3/ Data are rounded to the nearest hundred.

Note: NA = not available.

ing Singida by about 324,000 head (Table V-21). The Same/Mwanga districts combined with slightly over 200,000 head, accounted for about one-half the total cattle population of Kilimanjaro region in 1978.

For the other major categories of the livestock population (goats and sheep), Dodoma has about 600,000 goats and 420,000 sheep, while Singida has about one-half the Dodoma totals for goats and sheep (Table V-22). In the Same and Mwanga districts, the number of goats were about equal to the number of cattle (206,000 head), while the sheep population is about one-half the other two (108,000 head).

On a district basis, Dodoma Rural has the largest cattle population in the region (46 per cent of the total), and also for the nine districts in the study area. Kondoa and Mpwapwa are other important cattle districts in the region, while in Singida region, Singida Rural and Iramba districts together account for about 86 per cent of the region's total cattle population. Relatively similar relationships exist among the districts of the two regions in terms of goats and sheep (Table V-22). Distributions of cattle numbers among the administrative divisions of Dodoma and Singida reveal some similarities. For example, the average number of cattle per division in Dodoma region is 42,426, while in Singida region the division average is 43,269.

Of the top ten administrative divisions of Dodoma region with cattle populations in excess of 40,000 head in 1978, seven are located in Dodoma Rural district, one in Dodoma Urban and two in Mpwapwa (see Appendix Tables A-V-19 through A-V-21. In order of rank by districts they include:

District	Division
Dodoma Rural	Chipanga, Makangwa, Bahi, Chamwino, Mundemu, Mwitikira and Itiso
Dodoma Urban	Hombolo
Mpwapwa	Mpwapwa and Kibakwe

TABLE V-22
SUMMARY OF LIVESTOCK POPULATION BY STUDY REGIONS, DISTRICTS AND MAJOR ANIMAL CATEGORIES, 1978 CENSUS

Region and District	Cattle	Per Cent of Total	Goats (Number of Head)	Per Cent of Total	Sheep	Per Cent of Total
Dodoma						
Dodoma Rural	507,434	46.1	189,535	31.7	116,993	39.0
Dodoma Urban	113,048	10.2	67,592	11.3	17,807	5.9
Mpwapwa	230,553	20.9	145,785	24.4	67,439	22.4
Kondoa	252,037	22.8	194,979	32.6	98,347	32.7
Total	1,103,072	100.0	597,891	100.0	300,586	100.0
Singida						
Singida Rural 1/	338,842	43.5	189,323	45.2	108,878	45.4
Iramba	328,314	42.2	188,456	45.0	111,076	46.3
Manyoni	111,687	14.3	41,352	9.8	19,839	8.3
Total	778,843	100.0	419,131	100.0	239,793	100.0
Kilimanjaro						
Same	131,007	63.3	130,149	63.0	77,785	72.0
Mwanga	75,844	36.7	76,399	37.0	30,276	28.0
Total	206,851	100.0	206,548	100.0	108,061	100.0

1/ Includes cattle from Singida Urban.

Source: Appendix Tables A-V-9 to A-V-27.

In the Singida region, there are eight administrative divisions with cattle populations in 1978 in excess of 40,000 head. They consist of the following in order of rank by districts (see Appendix Tables A-V-23 through A-V-25:

District	Division
Singida Rural	Mtinko, Ilongero, Ikungi,
Iramba	Ndago, Nduguti, Shelui, Kinampanda, Kisiriri

None of the divisions in Kondoa, Manyoni, Same and Mwanga districts have cattle populations in excess of 40,000 head. The administrative division average for the Same and Mwanga districts is 20,685, about half that of Dodoma and Singida divisions.

Although there are some differences, in general the distribution of the goat and sheep populations among the divisions in the study areas tends to follow that of the cattle (see Appendix Tables A-V- 19 to A-V-27).

(3) Livestock Market Sales

(a) Regions and Districts

Livestock market sales at the approximately 104 market facilities operated by Tanzania Livestock Marketing Corporation in Dodoma and Singida regions averaged about 114,000 head per year over the period 1978 and 1979 (Table V-23). About 60 per cent of the total number of head sold were cattle, with 34 per cent goats and the remaining 6 per cent sheep. Of course, in terms of weight and value, the cattle make a much greater contribution to the market sales than the comparison of the raw numbers, but the latter are useful in understanding the animal composition of the sales.

Sales in all three categories of animals were larger from the Singida region than from Dodoma. This is perhaps reflected in the fact that the total livestock population of Dodoma is larger than that of Singida, which indicates that the former may be retaining its livestock for a longer period of time than the latter.

TABLE V-23

SUMMARY OF LIVESTOCK MARKET SALES BY STUDY REGIONS, DISTRICTS AND MAJOR ANIMAL CATEGORIES, AVERAGE OF 1978 AND 1979

Region and District	Cattle	Goats	Sheep	Total
		(Number of Head)		
Dodoma				
Dodoma Rural	10,086	5,369	449	15,904
Dodoma Urban	6,322	5,048	444	11,814
Mpwapwa	3,935	1,224	1,052	6,211
Kondoa	9,856	6,051	510	16,417
Total	30,199	17,692	2,455	50,346
Singida				
Singida Rural 1/	10,016	10,179	2,311	22,506
Iramba	20,711	8,421	1,972	31,104
Manyoni	8,041	2,135	180	10,366
Total	38,768	20,735	4,463	63,976
Kilimanjaro				
Same 2/	5,096	1,997 3/		
Mwanga 2/	1,426	650 3/		
Total	6,522	2,647		

1/ Includes Singida Urban.
2/ Markets were closed for several months in both 1978 and 1979 because of outbreak of cholera and hoof and mouth disease, thus used data for 1977 only as most representative.
3/ Includes goats and sheep. Data were not separated in the records.

Source: Tables V-24 to V-31.

Among the seven districts of the two regions, Iramba with nearly 21,000 head led by a substantial margin in cattle sales, followed by Dodoma Rural, Singida Rural and Kondoa, all in the vicinity of 10,000 head. In goat sales, Dodoma Rural was first, followed by Iramba, Dodoma Rural and Dodoma Urban in that order. Sales of sheep in the two regions were also largely in the Singida Rural and Iramba districts as well as in Mpwapwa.

Sales in the two districts of Kilimanjaro were small, numbering less than 9,200 head of all livestock in the two districts.[1/] Cattle sales accounted for over 70 per cent of the total, with most of the sales concentrated in the Same district. A note of caution in interpreting these sales volumes needs to be injected here. This is with respect to the previously mentioned fact that official market sales do not represent total livestock sales in the regions (nor in the rest of the country). Direct sales from the farms and villages to so-called bush traders and other buyers, along with direct movements out of the region to other markets both inside and outside Tanzania, where prices may be higher, are definitely taking place with field estimates as to these sales running as high as 20 to 30 per cent of total sales.

Two years of data on livestock market sales (1978 and 1979) were compiled from records of the various TLMC regional and district offices in Dodoma and Singida. Time did not permit the compilation of more years, since all of

1/ See Table V-31 for livestock market sales for Same district. Since market sales for the Mwanga district are concentrated in one division only, Usangi, these results do not warrant a table and thus are shown as follows:

	Cattle, Goats and Sheep (No. of Head)			
	1977	1978	1977	1978
Usangi division	1,426	468	650	293

Source: Zonal Office, Arusha, of Tanzania Livestock Marketing Corporation.

the sales data are on an individual market basis, and in most cases not identified by ward or administrative division. A further complicating factor and one that was very time-consuming is that in nearly all cases, the market data were on a monthly basis, thus it was necessary to copy each market's data as given and then total them later for the year.

Data gathered for the Same district consisted of com iling three years of data, 1977-79, in order to obtain representative year, due to the closure of some markets for a number of months as the result of outbreaks of cholera and Hoof and Mouth Disease. Market data for the Mwanga district covered only 1977 and 1978, since data for 1979 were not available.

(b) Administrative Divisions

Livestock market sales for cattle, goats and sheep by administrative divisions within each district are shown in Tables V-24 through V-31 by individual years and the average of the years. The data were averaged in order to obtain a composite year that is somewhat more representative than either 1978 or 1979 if used separately, since there is no distinct pattern among the districts or the divisions in terms of 1979 being a better, the same, or worse than 1978. For example, in Dodoma region total cattle sales for Dodoma Rural and Urban were less in 1979 than in 1978, while in Mpwapwa and Kondoa the opposite was true.

The analysis of the yearly average sales by administrative divisions and districts within each region shows that the leading divisions for cattle (and in most cases for goats and sheep also) ranked in order of number of head sold were the following:

Region	District	Administrative Division	Market Share of District Total (%)
Dodoma	Dodoma Rural	Mundemu, Bahi, Mwitikira, Chipanga	78
	Dodoma Urban	Hombolo	93
	Mpwapwa	Mpwapwa, Rudi, Kibakwe	82
	Kondoa	Mondo, Kwamtoro, Farkwa, Bereko	85
Singida	Singida Rural	Mtinko, Ikungi, Ihanja, Ilongero	86
	Iramba	Kisiriri, Ndago, Shelui	71
	Manyoni	Itigi, Manyoni, Kintinku	84
Kiliman-jaro	Same	Chome/Suji, Mwembe Mbaga	74
	Mwanga	Usangi	100

Source: Summaried from data in Tables V-24 to V-31.

TABLE V-24

LIVESTOCK MARKET SALES, DODOMA RURAL DISTRICT, DODOMA REGION, BY ADMINISTRATIVE DIVISION, 1978 AND 1979

Division	Cattle		Goats		Sheep		Cattle	Goats	Sheep
	1978	1979	1978	1979	1978	1979	Two-Year Average (No. of Head)		
	(No. of Head)								
Itiso	451	624	286	131	7	2	538	208	10
Chamwino	1322	656	506	445	144	76	989	476	110
Mvumi	69	43	169	85	35	5	56	127	20
Mwitikira	1390	2179	1002	1310	34	80	1784	1156	57
Chipanga	1808	1327	950	990	61	65	1568	970	63
Bahi	1947	2000	1271	1166	103	91	1974	1218	97
Makangwa	591	619	273	243	42	42	605	258	42
Mundemu	3254	1891	1206	707	81	18	2572	956	50
Total	10832	9339	5663	5077	517	379	10086	5369	449

Source: Data compiled from records of the Tanzania Livestock Marketing Corporation, Dodoma Branch.

TABLE V-25

LIVESTOCK MARKET SALES, DODOMA URBAN DISTRICT, DODOMA REGION, BY ADMINISTRATIVE DIVISION, 1978 AND 1979

Division	Cattle		Goats		Sheep		Cattle	Goats	Sheep
	1978	1979	1978	1979	1978	1979	Two-Year Average (No. of Head)		
	(No. of Head)								
Hombolo	6511	5241	4309	4662	423	353	5876	4436	388
Kikombo	601	290	584	541	96	15	446	562	56
Nala	-	-	-	-	-	-	-	-	-
Mpunguzi	-	-	-	-	-	-	-	-	-
Total	7112	5531	4893	5203	519	368	6322	5048	444

Source: Data compiled from records of the Tanzania Livestock Marketing Corporation, Dodoma Branch.

TABLE V-26

LIVESTOCK MARKET SALES, MPWAPWA DISTRICT, DODOMA REGION, BY ADMINISTRATIVE DIVISION, 1978 AND 1979

Division	Cattle		Goats		Sheep		Cattle	Goats	Sheep
	1978	1979	1978	1979	1978	1979	Two-Year Average (No. of Head)		
	(No. of Head)								
Mpwapwa	1866	1433	807	729	812	462	1650	768	637
Kibakwe	701	855	207	140	207	186	778	174	196
Mlali	28	124	10	-	10	8	76	5	9
Zoissa	189	394	17	12	16	7	292	14	12
Kongwa	274	444	27	54	18	31	359	40	24
Rudi	675	886	156	290	156	191	780	223	174
Total	3733	4136	1224	1225	1219	885	3935	1224	1052

Source: Data compiled from records of Tanzania Livestock Marketing Corporation, Mpwapwa Branch office.

TABLE V-27

LIVESTOCK MARKET SALES, KONDOA DISTRICT, DODOMA REGION, BY ADMINISTRATIVE DIVISION, 1978 AND 1979

Division	Cattle		Goats		Sheep		Cattle	Goats	Sheep
	1978	1979	1978	1979	1978	1979	Two-Year Average (No. of Head)		
	(No. of Head)								
Kondoa	-	-	-	-	-	-	-	-	-
Mondo	1974	3223	1851	4524	247	182	2598	3188	214
Farkwa	1868	3279	421	862	56	39	2574	642	48
Kwamtoro	2027	3143	773	1150	79	45	2585	962	62
Pahi	387	856	229	557	47	40	622	393	44
Goima	196	122	110	138	30	1	159	124	16
Bereko	796	980	359	431	95	21	888	395	58
Kolo	411	449	420	274	62	74	430	347	68
Total	7659	12052	4163	7936	616	402	9856	6051	510

Source: Data compiled from records of the Tanzania Livestock Corporation, Kondoa region.

TABLE V-28

LIVESTOCK MARKET SALES, SINGIDA DISTRICT, SINGIDA REGION, BY ADMINISTRATIVE DIVISION, 1978 AND 1979

Division	Cattle		Goats		Sheep		Cattle	Goats	Sheep
	1978	1979	1978	1979	1978	1979	Two-Year Average (No. of Head)		
	(No. of Head)								
Singida Rural									
Ihanja	964	572	1232	905	116	84	768	1069	100
Ikungi	2456	1112	2468	966	265	686	1784	1717	476
Mungaa	660	648	817	353	160	27	654	585	94
Mtinko	3997	3418	4072	3844	1047	737	3708	3958	892
Mgori	513	462	445	355	141	121	488	400	131
Ilongero	771	673	732	516	443	250	722	624	347
Subtotal	9361	6885	9766	6939	2172	1905	8124	8353	2040
Singida Urban	2076	1707	1866	1786	324	218	1892	1826	271
Total	11437	8592	11632	8725	2496	2123	10016	10179	2311

Source: Compiled from records of TLMC, Singida Office.

TABLE V-29

LIVESTOCK MARKET SALES, IRAMBA DISTRICT, SINGIDA REGION, BY ADMINISTRATIVE DIVISION, 1978 AND 1979

Division	Cattle		Goats		Sheep		Cattle	Goats	Sheep
	1978	1979	1978	1979	1978	1979	Two-Year Average (No. of Head)		
	(No. of Head)								
Kirumi	1330	1189	1192	999	293	320	1260	1096	307
Nduguti	1627	973	1702	1146	521	288	1300	1424	405
Kinyangiri	1799	1697	1212	1089	280	232	1748	1151	256
Kinampanda	1766	1728	866	786	148	78	1747	826	113
Kisiriri	4836	5720	1493	1691	314	356	5278	1592	335
Ndago	5180	4722	1562	2115	268	528	4951	1839	398
Shelui	4197	4657	309	677	111	204	4427	493	158
Total	20735	20686	8336	8503	1935	2006	20711	8421	1972

Source: Compiled from records of TLMC, Singida Office.

TABLE V-30

LIVESTOCK MARKET SALES, MANYONI DISTRICT, SINGIDA REGION, BY ADMINISTRATIVE DIVISION, 1978 AND 1979

Division	Cattle		Goats		Sheep		Cattle	Goats	Sheep
	1978	1979	1978	1979	1978	1979	Two-Year Average (No. of Head)		
	(No. of Head)								
Manyoni	1403	2589	374	391	85	4	1996	382	44
Itigi	1969	3670	455	407	13	15	2820	431	14
Manyoni Vijijini	437	304	356	143	38	-	371	250	19
Kintinku	1923	1986	790	634	114	38	1954	712	76
Nkonko	1086	714	433	286	48	6	900	360	27
Total	6818	9263	2408	1861	298	63	8041	2135	180

Source: Compiled from records of Tanzania Livestock Marketing Company, Ltd., Singida Office.

TABLE V-31
LIVESTOCK MARKET SALES, SAME DISTRICT, KILIMANJARO REGION, BY ADMINISTRATIVE DIVISION, 1977, 1978 AND 1979

Division	Cattle			Goats and Sheep		
	1977	1978 1/	1979 1/	1977	1978 1/	1979 1/
	(No. of Head)					
Same	757	108	970	259	143	46
Mwembe Mbaga	893	197	913	398	158	8
Gonja	-	-	-	-	-	-
Chome/Suji	2,880	741	1,005	1,147	721	240
Mamba Vunta	566	67	26	193	24	-
Ndungu	-	-	-	-	-	-
Total	5,096	1,113	2,914	1,997	1,046	294

1/ Markets were closed from 4 to 11 months because of outbreak of cholera and hoof and mouth disease.

Source: Zonal Office, Arusha, of Tanzania Livestock Marketing Corporation, and Livestock Development Officer, Same.

6. Agricultural Potential

Information from field interview and observations and secondary data sources indicates a rather substantial agriculture potential in the three study areas (Dodoma and Singida Regions and the Same/Mwanga Districts of Kilimanjaro. This is so in spite of the variability of climatic conditions and rainfall, the presence of plant and animal diseases, bird damage, and soil fertility problems and related matters. An accurate estimate of the real potential cannot be made at this point of time because of the lack of detailed information on agricultural soils capability, on the one hand, and the actual amount of land which is currently under cultivation, on the other. Some indications of this potential can be seen in the following tabulation which shows the total land areas of the three study regions classified into broad categories of potential land use. Unfortunately, it was not possible to separate the Same and Mwanga districts of Kilimanjaro from the region as a whole. Although there would undoubtedly be some changes in the various land use categories for the two districts as compared with the region, these differences are believed to be relatively insignificant.

Soil categories 5 and 6, which cover low to medium fertility with moderate potential (5) and medium to high fertility with high potential (6), represent a significant percentage of the total potential land use in the three regions. (See Table V - 32) Singida has about 19 percent of its total in these two combined categories, Dodoma, about 25 percent, and Kilimanjaro about 30 percent. In terms of areas these percentages translate into 3,700 square miles for Singida, slightly over 4,000 square miles for Dodoma and about 1,500 square miles for Kilimanjaro. When one compares these moderate to high potential land use areas to the estimated land in cereals for 1973, the latter represents only 6.5 percent (599/9,252 sq. miles). A word of caution needs to be given here, however, and that is with regard to the accuracy of the land potential categories in a map of scale of 1:3,000,000 which applies to the country as a whole.

A related but even more difficult problem was encountered in seeking soils studies and maps from which approximations could be made of the relative agricultural potential of the administrative divisions among each of the three study regions. A promising source for this information was a series of land resource studies which had been completed under a United Nations Development Program in 1969. Although after considerable search a set of these draft publications were discovered in the library of the Ministry of Agriculture,

TABLE V - 32

POTENTIAL LAND USE BY CATEGORIES

DODOMA, SINGIDA, AND KILIMANJARO REGIONS

ITEM TOTAL LAND AREA (Sq. Miles)	DODOMA 15,950		SINGIDA 19,050		KILIMANJARO 1/ 5,100	
LAND AREA BY LAND USE CATEGORY NUMBER 2/	% of Total Land Area	Area (Sq. Miles)	% of Total Land Area	Area (Sq. Miles)	% of Total Land Area	Area (Sq. Miles)
1	-	-	-	-	14.3	728
2	15.8	2,520	2.5	476	24.5	1,249
3	1.7	271	-	-	6.7	342
4	38.0	6,062	60.4	11,507	-	-
5	15.4	2,456	10.9	2,076	17.6	898
6	9.9	1,579	8.4	1,600	12.6	643
7	-	-	-	-	6.7	342
8	19.2	3,062	17.8	3,391	17.6	898
Total	100.0	15,950	100.0	19,050	100.0	5,100
Land in Cereal Grains:	2.1	335	0.9	164	2.0	100

1/ Includes the total of Kilimanjaro Region. No separation was possible for the Same/Mwanga Districts.

2/ Key to categories:

No. 1 - Soils unsuitable for cropping.
No. 2 - Soils where little cropping possible
No. 3 - Fertile soils where low rainfall or shallow rooting depth limits crop yields.
No. 4 - Soils of very low fertility with moderate potential.
No. 5 - Soils of low to medium fertility with moderate potential.
No. 6 - Soils of medium to high fertility with high potential.
No. 7 - Soils of low fertility in areas of high rainfall
No. 8 - Various alluvial or colluvial soils of considerable potential but often requiring flood control, drainage, or special management.

Source: Adapted from: An Analysis of the Tanzania Food Crop Subsector, The University of Missouri at Columbia, 1975. (Field work accomplished in March-May, 1973) Land area by land use were derived from land use potential map, 1967 Atlas of Tanzania.

the volume relating to the Land Resources of Northeastern Tanzania was missing. This volume covers the area in which the study regions are located.

Repeated attempts were made to locate this volume in the library as well as from other sources, but none was successful. In lieu of this more promising source, it was necessary to utilize the more general information available from the Tanzania Atlas of 1976 relating to the map of Soils and the map of Capability of Soils for Agriculture. These maps, in turn, were based upon R.M. Baker, The Soils of Tanzania, 1970.

Soil types, characteristics, and capability among the divisions was determined from the maps by relating the regional maps with administrative boundaries to the soils maps on the basis of latitude and longitude readings.

The map information was supplemented by field information received in particular from the District Agricultural Development Officers concerning the agricultural potential of the divisions within their respective districts.

The agricultural potential information was utilized in Part VI., as one of the economic factors for ranking the administrative divisions. Ratings of High, Medium, and Low with factor values of 100, 55 and 10 corresponding to the order of the ratings were assigned to the divisions within each of the study regions. A weighting of 10 percent was applied to this factor out of a total of 100 percent for the 11 factors.

C. Other Economic Activity

Special attention was placed during the field survey on other economic activities in the three study regions which may be influenced by the existing condition of the rural road system. Interviews with appropriate functional managers and ministry planning specialists were directed to the identification of current transportation problems and the potential impacts of improved roads on the various non-agricultural sectors of the Tanzanian economy. Of the three study regions only one, Dodoma, has a current Regional Interim Development Plan.[1/] This plan was employed to supplement the results of the field interviews. There are no plans for the Singida and Kilimanjaro (Same/Mwanga) regions at this time.

The sectors which were identified for analysis included small industry, forestry, and fishing.

1. Small industry

a. Introduction

Industry constitutes a small part of the economy of Tanzania--approximately 10 per cent of the nation's Gross Domestic Product. When Tanzania achieved independence in 1961, industrial development was negligible. Industries existing in the country employing

1/ Office of the Regional Development Director, Dodoma Interim RIDEP, Working Papers, Vol. I and IV, January 1980.

10 or more people with capital investment over T/shs 20,000 numbered only 220. Most of these were small concerns with a capital investment not exceeding T/shs 200,000. The only significant industries inherited at independence include tobacco manufacture (cigarettes), beer and soft drinks whose products were meant for a small group of urban dwellers. Since independence the Party and the government have emphasized the sector by defining and taking various policy measures for its development. This began with the Arusha Declaration (1967), which initiated local control of the major means of production.

The Second Five Year Development Plan objectives were to initiate industrial development in rural areas through the establishment of small industries, and to improve skills and employment in the industrial sector.

In developing industries, industrial projects have been divided into three groups: (1) national industries, (2) district industries, and (3) village industries.

National industries are medium and large industries producing goods for the domestic market, exports for use in other industries. By their very nature, national industries are few and cannot be established in every region. Their location is governed by availability of raw materials and markets.

District industries consist of medium and small industries. A high proportion of the basic consumer goods is produced by these industries. These industries involve simple technology, rendering them flexible and easier to locate near the consumers. The objective is to make industrial activities part of overall district development.

Under the Village and Ujamaa Villages Act, villages are empowered to initiate and establish industries as one of their most important economic activities. These industries supply some basic requirements of villagers themselves as well as the neighboring villages and districts. Other promoters of these industries are cooperative groups and private individuals.

SIDO was established to promote the development of small-scale industries which were to utilize resources in villages for

the benefit of the villagers. SIDO undertakes basic research, plans and encourages the establishment of small scale industries, provides consultant services on technology where required, looks for markets for the products, and provides training facilities and expertise for the development of small scale industries.

SIDO sponsors the following types of industries:

--Industrial Estates for Small Scale Industries--The objective is to establish industrial estates in all regions by giving priority to the least industrially developed regions. In these estates production is for regional markets, consultant services are offered to industrial cooperative groups, villages, DDCs, and private individuals intending to establish industries in districts and villages. The estates are intended to provide the necessary industrial infrastructure in the regions.

--Village Industries and Industrial Cooperatives--The goal is to assist cooperative groups and village governments in initiating and establishing industries in villages. SIDO assists in feasibility studies, constructs industrial buildings, and facilitates loans for machinery and equipment and technical training.

--Handicrafts--The objective is to encourage handicraft activities to use modern techniques and equipment where the nation has special advantage in traditional skills and thereby enables individuals and groups to earn an income. The development of small industries has additional advantages such as: the expansion of employment opportunities, decentralization of industries, and economic and technological development in villages.

b. Status of Small Industry

Interviews were conducted as part of the field survey with regional SIDO centers and the national office in Dar es Salaam. These interviews were directed to identification of existing industries, with respect to location, number of establishments, number of employees, committed investment, and annual output. In addition, the interviews were conducted to secure future plans for increased development and an overview of the perceptible problems of road transportation.

A comparative summary of existing small industries by region and district is presented as Table V-33. The summary statistics aggregate artisans, non-factory and factory industries. Artisan industries include small activities such as furniture making,

TABLE V-33
SUMMARY OF EXISTING SMALL INDUSTRIES BY REGION AND DISTRICT, 1978

Region	District	Number of Establishments	Number of Employees	Annual Output (000 T/shs)
Dodoma	Dodoma Rural	48	184	3,820
	Dodoma Urban	61	547	15,042
	Mpwapwa	40	320	3,887
	Kondoa	22	83	1,810
	Total	171	1,134	24,559
Singida	Singida Rural	14	142	5,056
	Singida Urban	6	298	23,825
	Iramba	10	117	2,130
	Manyoni	6	124	12,021
	Total	36	881	33,032
Kilimanjaro 1/				
	Same	51	531	6,181
	Mwanga	15	152	1,298
	Sub-total	66	683	7,479
	Total	276	2,698	65,070

1/ Same and Mwanga districts of region.

Source: Compiled from SIDO District Office data.

tailoring, shoemaking, pottery production, and blacksmithing. Non-factory industries include agro-based industries (e.g., maize mills), building material industries (e.g., saw mills, wooden building supplies), food-based industries (e.g., bakeries, fish drying establishments), household items (e.g., laundry soap production), and clothing and apparel (e.g., hand loomed cloth firms). Factory-based industries include production of such items as cement, pipes, nails, and health supplies and equipment. At this juncture, it can be noted that although the number of establishments is rather small the annual output by district exceeds the total investment which includes equipment, training, and start-up costs.

Although the output per employee, measured in T/shs, varies by type of industry, it may be observed that each employee in the factory sector contributes about T/shs 60,000 of annual output, as compared with about T/shs 20,000 in the non-factory and artisan categories combined. Artisan output per employee varies considerably as a function of the type and size of industry.

As a general observation it can be seen that equipment, buildings and installation represent about 70 per cent of the initial investment in small industry, while training and working capital represent 10 per cent and 20 per cent, respectively.

Although evidence is not available to gauge the village and district impact of SIDO investment and assistance programs, it is clear that the success of existing and planned (1979-1983) investments will require continued and expanded infrastructure services such as electricity and transportation access.

c. Investment, Output and Employment

The interview process with SIDO district offices produced insight on the role of small industry development on the village, district, and regional economies; specific statistics which are currently available; and future plans which reflect national objectives for self-reliance and village development.

The statistics with respect to investment, output, and employment are presented as Tables V-34 through V-36. It should be noted that the dispersal of industry between regions and within

TABLE V-34

DODOMA REGION SMALL INDUSTRIES PROGRAM THROUGH 1978 BY ADMINISTRATIVE DIVISION

District	Administrative Division	Number of Establishments	Number of Employees	Initial Investment (000 T/shs)	Annual Output (000 T/shs)
Dodoma Rural					
	Itiso	48	144	2,160	2,789
	Mwitikira	20	40	928	1,031
	Total	68	184	3,088	3,820
Dodoma Urban					
	Hombolo	1	5	20	12
	Urban Center	40	542	11,458	15,030
	Total	41	547	11,478	15,042
Mpwapwa					
	Mpwapwa	39	316	2,860	3,860
	Mtali	1	4	23	27
	Total	40	320	2,883	3,887
Kondoa					
	Kondoa	21	80	952	1,800
	Pahi	1	3	25	10
	Total	22	83	977	1,810
Total		171	1,134	18,422	24,559

Source: Compiled from SIDO National Headquarters data.

TABLE V-35

SINGIDA REGION SMALL INDUSTRIES PROGRAM THROUGH 1978 BY ADMINISTRATIVE DIVISION

District	Administrative Division	Number of Establishments	Number of Employees	Initial Investment (000 T/shs)	Annual Output (000 T/shs)
Singida Rural	Ihanja	3	28	120	563
	Ikungi	3	20	187	788
	Mungaa	2	39	205	589
	Mtinko	3	27	417	2,241
	Mgori	2	13	24	210
	Ilongero	1	15	133	665
	Total	14	142	1,088	5,056
Singida Urban		6	298	15,893	23,825
Iramba	Kirumi	1	18	20	175
	Nduguti	2	30	88	453
	Kinyangiri	1	26	165	612
	Kinampanda	1	10	15	13
	Kisiriri	1	5	250	647
	Ndago	2	22	23	179
	Shelui	2	6	25	51
	Total	10	117	586	2,130
Manyoni	Manyoni	1	24	20	288
	Itigi	1	22	68	360
	Nkonko	4	78	289	1,373
	Total	6	124	377	12,021
Total		36	881	17,964	33,032

Source: Compiled from SIDO Singida District Office data.

TABLE V-36

KILIMANJARO REGION SMALL INDUSTRIES PROGRAM THROUGH 1978 BY ADMINISTRATIVE DIVISION[1/]

District	Administrative Division	Number of Establishments	Number of Employees	Initial Investment (000 T/shs)	Annual Output (000 T/shs)
Same	Same	18	148	3,271	2,702
	Mwembe Mbaga	4	58	292	994
	Gonja	7	148	849	1,225
	Chome/Suji	6	114	232	849
	Mamba Vunta	2	5	14	39
	Ndungo	15	58	513	372
	Total	51	531	5,171	6,181
Mwanga	Ugweno	2	3	66	2
	Usangi	3	24	786	127
	Mwanga	7	37	24	434
	Lembeni	3	88	521	735
	Total	15	152	1,397	1,298
Total		66	683	6,568	7,479

1/ Same and Mwanga districts of Kilimanjaro region.

Source: Compiled from SIDO Kilimanjaro District Office data.

districts is very uneven. This relates directly to the embryonic stage of this area of national development, the poorly developed infrastructure, and the developmental nature of the foreign investments in this sector.

Of the 171 establishments in the Dodoma region, 121 are maize mills with approximately 3 employees each. Of the 50 remaining industries, 27 are factory-type farms, 15 are factories, and 8 are classified as artisan-based firms. In the Singida region there are 16 grain mills within the total of 36 small industries located in the region. Of the 66 establishments in the Same and Mwanga districts of the Kilimanjaro region, there are 11 factories, 21 grain mills, and 34 non-factory and artisan establishments.

The National Milling Corporation has constructed a large grain mill in the city of Dodoma and has plans to expand its storage facilities. There are also plans for a soft drink plant and a modern slaughter house. Several areas in Dodoma city have been planned for small industry, including a wood screw and rivet plant, a wire nail factory and a paper products factory. Small industries have proceeded slowly in the Dodoma region due to the limited availability of local raw materials, lack of credit, difficulty in procuring equipment and machinery, and poor and costly transportation. At present, the major problems in the Mpwapwa, Kondoa and Dodoma Rural districts are related to the need for technical training, establishment of SIDO branch offices in Kondoa and Mpwapwa, need for vehicles, and the need for foreign loans for industrial development.

The Dodoma Regional Interim Development Plan has identified the need for craft training facilities in Mpwapwa, Kondoa and some of the trading centers in Hombolo, Mlali, Bereko and Mvumi.

In the Dodoma region the number of establishments in the Dodoma Rural district represent 40 per cent of the total number of firms, while the Dodoma Urban, Mpwapwa and Kondoa districts represent 24, 23, and 13 per cent of the total, respectively. Of the 36 establishments in the Singida region, 55 per cent are in the Singida Rural and Urban districts, while 27 per cent are in the Iramba district, and only 18 per cent are in the Manyoni district. The majority of the 66 firms in the Same and Mwanga districts are in the Same district.

Seventy-seven per cent of the firms are in the Same district and 23 per cent are in the Mwanga district.

d. Transportation Requirements

Although the range of small industries covers a wide spectrum of factory type, non-factory type, and agricultural processing plants, the requirements for transportation are consistent throughout the study regions. The field studies indicated that the success of the village industries, outside the industrial estates which are located in district centers, rely heavily on the availability of all-weather roads and available transport. Recent government emphasis has been placed on village acquisition of suitable multi-use trucks. As this program is implemented to reduce village dependence on the private truck fleet, the requirement for reliable road surfaces will become even more obvious. The existing condition of the rural access roads will have an extremely serious impact on the life and maintenance requirements of village trucks if left unimproved.

e. Planned Small Scale Industries Development Program

The Second Five Year Plan major objective, as far as small scale industrial production was concerned, was to encourage increased use of locally available raw materials.

Following the March 1973 Party directive on the necessity for country-wide small industries promotion, industrial estates were started in Dar es Salaam, Tabora, Bukoba, Dodoma, Singida, and Njombe. SIDO personnel have been posted in the regions to advise on the preparation and implementation of small industrial projects. Many regions have started diversified small industries activities.

Small industries objectives during the Third Five Year Development Plan are:

--Provision of sufficient services for the promotion of small scale industries in both urban and rural areas. Such services will include expertise, raw materials, markets and credits.

--Provision of technical and organizational know how to District Development Corporations in their efforts to promote small scale industries.

--To produce various items which can be produced in small scale industries in the regions so as to meet the needs of various regions.

--Start as many industrial and handicraft workshops as possible in every region.

--Start industrial estates in regional centers where such estates are non-existent.

--Provision of industrial centers with adequate offices, vehicles, godowns and any other necessary facilities.

--Increase utilization of regionally available raw materials as a way of developing the economic well being of the regions.

--Find ways and means of promoting the economic well being of those people engaged in the informal sector undertakings.

A total of T/shs 170 million has been set aside for the establishment and running of small-scale industries during the Third Plan period.

The procedure for development of small industries follows a sequence of identifying four-year (1979-1983) investment goals with respect to type of industry, planned investment, anticipated employees, and anticipated annual output. This planning process is conducted by SIDO at the district level in coordination with regional executives. After the plan is approved, the second phase involves the specification of the location of the industry at the village and/or district center. At this juncture the three study regions have approved plans. However, the specific location at the administrative division level is not available. A summary of the basic small scale industry plans for the study regions is presented as Table V-37.

In Singida there are plans for the establishment of 57 small industries with employment of 687, investment of T/shs 28.7 million, and annual output of T/shs 33.7 million. In the Same/Mwanga districts of Kilimanjaro, there are plans for 273 small establishments with employment of 2,091, investment of T/shs 8.7 million, and annual output of T/shs 9.5 million.

The proposed SIDO industrial estate in Dodoma will require an investment of T/shs 16.7 million, employ 225 people, and have an annual output of approximately T/shs 13.0 million. In all, the plan proposes the establishment of 35 small firms with a total employment of 700, and 84 craft shops employing about 350 people

TABLE V-37
PLANNED INVESTMENTS IN SMALL INDUSTRIES PROGRAMS BY REGION

Region and Years	Planned Number of Establishments	Planned Number of Employees	Planned Investment (000 T/shs)	Planned Annual Output (000 T/shs)
Dodoma 1/				
1979-1980	10	104	5,870	8,160
1980-1981	9	138	5,274	8,190
1981-1982	9	318	3,955	13,000
1982-1983	7	140	4,101	6,370
Total	35	700	19,200	35,720
Singida				
1979-1980	25	403	19,566	23,045
1980-1981	16	151	3,830	4,925
1981-1982	8	100	2,920	2,700
1982-1983	8	33	2,415	1,000
Total	57	687	28,731	33,670
Kilimanjaro 2/				
1979-1980	58	661	580	630
1980-1981	63	531	1,435	1,520
1981-1982	65	463	5,405	6,030
1982-1983	51	436	1,290	1,360
Total	237	2,091	8,710	9,540
Total	329	3,478	56,641	78,930

1/ Developed from partial data.
2/ Same and Mwanga districts.

Source: Compiled from SIDO District and National Headquarters data.

during the 1979-83 period. Data with respect to the small artisan establishments are not available.

Through discussions with SIDO executives it was determined that the national emphasis on small industry development will continue throughout the next two decades, subject to fund availability at approximately the same levels and regional distribution represented by the 1979-1983 commitments. As small industry development objectives continue to be implemented, the dispersion of small industry to the rural villages outside of the industrial estates will be evidenced. This dispersion to the villages will necessitate reliable roads for the transport of employees, manufacturing imports, and finished products.

f. Impact of Improved Rural Access Roads

Interviews with the SIDO representatives highlighted the relationship of improved rural access roads to the future development of existing and planned industrial estates in the Dodoma and Singida urban areas and Moshi town, and the rural village firms throughout the three regions. The development of small industry is linked to the accessibility of the workers to the firms and training facilities. Current transportation of employees is primarily provided by bus service. Local bus service, off the main roads, has been reduced dramatically due to the condition of the roads. As the condition of the roads has eroded, the bus operators are reluctant to serve rural areas because of the high cost of equipment maintenance, frequency of breakdowns, and the length of time equipment is out of service for repair.

Improved access to villages will also facilitate the transportation of the raw materials of production and the output of the firms Although effort is placed on locating firms close to the required imports, the scarcity of raw materials necessitates road haul to most villages.

As the roads are improved the cost of transporting the materials of production and the finished products will be reduced. Improved roads will also facilitate the transport of training personnel, SIDO representatives and buyers to purchase the products of such items as processed agricultural products, woven cloth products, and artisan crafts.

The transport of small machinery and building materials will also be facilitated by improved all-weather roads.

2. Forestry

a. Introduction

Government policy on forestry emphasizes conservation of existing forests, expansion of indigenous forests and planting new forests. The objectives of this policy are to have forests available for different economic uses, such as timber, construction poles, and firewood. Also forestry conservation has the purpose of preventing soil erosion and providing water catchment areas.

There are 130,000 square kilometers of indigenous forest reserves, which make up 70 per cent of all forest land in the country. Of these, 16,140 square kilometers are controlled forest areas associated with water catchment forest projects. Steps are being taken to increase the acreage under forest reserves and to reduce the brush areas which are breeding areas for the tsetse fly. During the Second Five Year Development Plan, 16,525 hectares of softwood and 3,180 hectares of hardwood were planted. Recently, the government has put more emphasis on village afforestation. Villagers have been advised to grow trees beside their plots or houses. District forest and fuel wood projects recently started and planned over the new term will not produce output until the trees reach maturity-- about 10 years.

Some of the problems that face natural resources activities include:

--Scarcity of vehicles and other equipment make the work of forest conservation and expansion of forest reserves difficult. Shortage of experts of various cadres is another serious problem.

--The increase in the uses of wood and wood-based products has grown faster than the production of wood. Consequently, there has been a corresponding increase in the price of wood and wood-based products.

--Limited capacity to manage sawmills formerly run by private entrepreneurs.

--Lack of properly developed plans for harvesting and using forest products.

--Lack of reliable inventory especially of indigenous trees, which in turn causes imbalances between tree felling and expansion of forest reserves.

--Lack of a comprehensive training program for the skills needed in the development of forests and forest products.

The objectives of the Third Five Year Development Plan include: (1) the development of all types of forests, i.e., plantation forests, will be emphasized rather than concentrating efforts on plantation forests alone; (2) the planning and development of village afforestation; (3) establishment of the proper utilization of forest products and industries using these products so that the country becomes self-sufficient in timber-based products; and (4) the training in all levels of manpower, especially in wood industry technology and management.

Programs and targets during the Third Five Year Plan include: planting 7,500 hectares of indigenous trees in forest plantations and weeding 16,000 hectares of existing indigenous forests; planting 24,000 hectares of soft woods, and 3,800 hectares of hardwoods; preventing soil erosion especially in Kondoa, Lushoto, Kilimanjaro, Singida, Shinyanga, Mara and Mwanza; and training 91 foresters at degree level and 160 at diploma and certificate levels by 1980.

The forestry personnel are employed in nurseries and forest plantations, extension services to the villages in reclaiming eroded areas, and building windbreaks and monitoring the illegal removal of timber from forest and fuel wood projects.

Efforts in tapping forest resources will be increased through cooperation with Tanzania Wood Corporation (TWICO), TWICO subsidiaries, and other public bodies. The felling of logs is expected to reach 300,000 cubic meters annually by 1981; exports of timber are expected to reach 15,000 cubic meters annually. TWICO will consolidate sawmills which at present are operating at low capacities due to old machines and equipment.

A summary of the forest production and sales in the three study regions by district is presented in Table V-38. The production and sales figures represent only that portion which is reported as sold.

b. Forest Products

Interviews were conducted with the natural resources forest functional managers, in each of the nine study districts, to col-

lect statistics and to develop an appreciation of the relationship between the rural road system and forest product development.

The interviews were used to produce the average forest production and sales statistics for the period 1977-1979. These statistics were assigned to each of the administrative divisions within each of the districts in the study regions (refer to Tables V-39 through V-41). The forestry statistic which was employed in the road prioritization system was that of production reported in cubic meters.

Production varies considerably over time in each of the areas due to statistical reporting inconsistencies, periodic limitations on harvesting, and variations in rainfall.

The fuel wood and charcoal production figures should not be regarded as representative of total production in each of the administrative divisions. This is because most of the production, collected from public lands, is for home consumption (subsistence), and therefore is not counted in the statistics.

There are approximately 14,000 km^2 of woodlands in the Dodoma region. Of this total, 942 km^2 are in forest reserves. The demand for fuel wood and charcoal is greater than the woodlands can supply. The urbanization in the Dodoma region and the collection of people in small communities in rural areas has placed severe pressure on the woodlands. The pressure for fuel is anticipated to increase dramatically over the next ten years. Steps are being taken, and planned in the Dodoma Region Interim Plan[1/] to anticipate the fuel shortage and increase production of all woodland and forest products. These plans include the landscape improvement programs in the Master Plan for the Capital Development Authority, the Kondoa Town Fuel Wood Scheme, and the village woodlots program. There are continuing plans to expand the nursery production and plantation planting in each of the four districts of the region. The production of seedlings in 1977/78 was approximately 416,209 in Dodoma Urban, 748,623 in Dodoma Rural, 370,000 in Kondoa, and 762,170 in Mpwapwa.

1/ Office of the Regional Development Director, Dodoma Interim RIDEP, Working Papers, Vol. I, Annex II, January 1980.

TABLE V-30

FOREST PRODUCT SALES REGIONAL SUMMARY 1977-1979 1/

Region	District	Timber Production (M^3)	Timber Value (000 T/shs)	Fuel Wood Production (M^3)	Fuel Wood Value (000 T/shs)	Charcoal Production (M^3)	Charcoal Value (000 T/shs)
Dodoma	Dodoma Rural	50	2.2	2,760	7.2	615	6.0
	Dodoma Urban	26	1.2	1,368	3.6	298	3.0
	Mpwapwa	160	7.3	75	1.2	315	3.4
	Kondoa	97	7.9	677	2.7	396	3.9
	Total	333	18.6	4,880	14.7	1,624	16.3
Singida	Singida Rural	-	-	2,147	6.5	2,540	25.4
	Singida Urban	-	-	-	-	-	-
	Iramba	445	24.9	662	1.9	2,160	21.6
	Manyoni	7,965	446.0	-	-	990	9.9
	Total	8,410	470.9	2,809	8.4	5,690	56.9
Kiliman-jaro 2/	Same	2,605	145.9	540	1.6	810	8.1
	Mwanga	40	2.2	-	-	-	-
	Total	2,645	148.1	540	1.6	810	8.1
Total		11,388	637.6	8,229	24.7	8,124	81.3

1/ Average reported transactions for period 1977-1979.
2/ Same and Mwanga districts of Kilimanjaro region.

Source: Forestry Divisions, District Natural Resources Development Office.

TABLE V-39

FOREST PRODUCT SALES, DODOMA REGION, 1977-1979[1/]

District	Administrative Division	Timber Production (M^3)	Timber Value (000 T/shs)	Fuel Wood Production (M^3)	Fuel Wood Value (T/shs)	Charcoal Production (M^3)	Charcoal Value (T/shs)
Dodoma Rural	Itiso	20	900	1,100	2,800	240	2,400
	Chamwino	10	450	550	1,400	125	1,200
	Bahi	10	450	560	1,600	125	1,200
	Makangwa	10	450	550	1,400	125	1,200
	Total	50	2,250	2,760	7,200	615	6,000
Dodoma Urban	Hombolo	20	920	1,250	2,700	240	2,400
	Nala	6	280	343	900	58	600
	Total	26	1,200	1,368	3,60[illegible]	298	3,000
Mpwapwa	Mpwapwa	20	1,000	15	240	40	400
	Kibakwe	30	1,300	15	240	63	600
	Mlali	60	2,600	15	240	106	500
	Kongwa	25	1,200	15	240	50	500
	Rudi	25	1,200	15	240	56	700
	Total	160	7,300	75	1,200	315	3,400
Kondoa	Kwamtoro	47	3,900	324	1,300	190	1,900
	Pahi	25	2,000	176	700	103	1,000
	Goima	25	2,000	177	700	103	1,000
	Total	97	7,900	677	2,700	396	3,900
Total		333	18,650	4,880	14,700	1,624	16,300

1/ Average reported transactions for period 1977-1979.

Source: Forestry Division, District Natural Resources Development Office.

TABLE V-40

FOREST PRODUCT SALES, SINGIDA REGION, 1977-1979[1/]

District	Administrative Division	Timber Production (M^3)	Timber Value (000 T/shs)	Fuel Wood Production (M^3)	Fuel Wood Value (T/shs)	Charcoal Production (M^3)	Charcoal Value (T/shs)
Singida Rural							
	Ihanja	-	-	1,180	3,540	1,400	14,000
	Ikungi	-	-	337	1,011	380	3,800
	Mgori	-	-	210	630	250	2,500
	Ilongero	-	-	420	1,260	510	5,100
	Total	-	-	2,147	6,441	2,540	25,400
Singida Urban		-	-	-	-	-	-
Iramba							
	Kirumi	85	4,760	132	396	560	5,600
	Kinampanda	95	5,320	133	399	400	4,000
	Ndago	265	14,840	397	1,191	1,200	12,000
	Total	445	24,920	662	1,986	2,160	21,600
Manyoni							
	Itigi	3,985	223,160	-	-	495	4,950
	Nkonko	3,980	222,880	-	-	495	4,950
	Total	7,965	446,040	-	-	990	9,900
Total		8,410	470,960	2,809	8,427	5,690	56,900

1/ Average reported transactions for period 1977-1979.

Source: Forestry Division, District Natural Resources Development Office.

TABLE V-41

FOREST PRODUCT SALES, KILIMANJARO REGION, 1977-1979[1/]

District	Administrative Division	Timber Production (M^3)	Timber Value (T/shs)	Fuel Wood Production (M^3)	Fuel Wood Value (T/shs)	Charcoal Production (M^3)	Charcoal Value (T/shs)
Same							
	Gonja	841	47,096	180	540	270	2,700
	Chome/Suji	1,764	98,784	360	1,080	540	5,400
	Total	2,605	145,880	540	1,620	810	8,100
Mwanga							
	Lembeni	40	2,240	-	-	-	-
	Total	40	2,240	-	-	-	-
Total		2,645	148,120	540	1,620	810	8,100

1/ Average reported transactions for period 1977-1979 for the Same and Mwanga districts of Kilimanjaro region.

Source: Forestry Division, District Natural Resources Development Office.

In 1977-1978 there were 71 hectares of plantations in the Dodoma Urban district, 180 hectares in Dodoma Rural, 146 hectares in Kondoa, and 245 hectares in Mpwapwa.

The aim of the Kondoa town fuel wood scheme is to plant 100 hectares of fuel wood annually starting in 1981. The village tree blocks include the planting of 2,100 hectares in 21 villages. This will include 50 hectares each year at Kingale Juu, Tandala, Busi, Churuku and Jangalo in the Kondoa district. In the Mpwapwa district the plans are for 352 hectares in Sagara, 199 hectares in Laikala, 213 hectares in Ibwega and Mlali Bondeni. There are four 75-hectare sites in the Dodoma rural district (Mlowa Bwawani, Mlowa, Barabarani and Mloda), and one 50-hectare site at Mvumi. In the Dodoma Urban district there are plans for eight 10-hectare sites in the barren areas of Mbabala, Mbalawala, Chahwa, Vikonje, Ntumbe, Kikombo, Ihuma and Zepisa.

The natural forests in the Same district, approximately 7,300 hectares, are within a protected area. The most productive forest in the Same district is the 14,300-hectare natural forest in Chome/Suji administrative division. The log production, however, is decreasing due to conservation measures. The 70-hectare forest at Gonja has very low production, and the 3,000-hectare natural forest at Mwembe Mbaga is reserved as a catchment protective reserve.

The only production forest (884 hectares) in the Mwanga district is located in Lembeni. Over 4,000 hectares of reserved forests are located in the Ugweno administrative division. The timber produced in the South Pare Mountains, most of which is camphor, is marketed individually to middlemen who in turn transport the product to Tanga or Dar es Salaam.

Most of the Singida district roads terminate at the villages while suitable trees for timber production are deep in the districts' remote areas. The transport of sawn timber is limited because of the condition of the roads, which for the most part are unreliable on an all-weather basis. The vast area of the Singida district is bare of vegetation due to soil erosion. The utilization of available forests and the effectiveness of the afforestation program are directly related to the condition of the feeder roads.

In the Iramba district the forest harvest areas are at Mpukizi, Mwandoigembe, Kiderafa, Urughu and Mkulu. Mpukizi, Mwandoigembe and Urughu are within the Ndago division, while Kiderafa is within the Kirumi division and Mkulu is within the Kinampanda area. The only forest conservation area is located at the Sekenko catchment area.

There are two small scale experimental plantations in the Manyoni district. One is a 30-hectare site in Mkwese and the other is a 72-hectare site at Itigi. The major forest reserve conservation area is the Kizigo Game and Forest Reserve and the Rungwa Forest Reserve. The forest products of the Iramba district come from open public lands in the Kirumi, Kinampanda and Ndago administrative divisions.

It should be noted that the majority of wood products are harvested from the districts within the Kilimanjaro and Singida regions. The Same district of Kilimanjaro region produces 23 per cent of the total reported sales of timber in the study regions. The Manyoni district of the Singida region produces approximately 73 per cent of the total study area output.

c. Transportation Requirements

The transport of timber products to village and district centers is accomplished primarily by trucks in the study regions. Although the current relatively small transport requirements appear to be met by the existing fleet of vehicles, the existing road system limits the useful and effective life of vehicles, and year-round flows of products; increases the operating cost of vehicles and limits the potential to reach the national goals for forest development and production.

It was indicated at each district Natural Reserve Office that inadequate transport is a major bottleneck in the provision of services to the villages and throughout the district. The lack of a reliable all-weather rural road system impedes 1) the transport of seedlings grown in nurseries to the villages and forest projects, 2) the management and supervision of forest product harvesting and conservation, and 3) the reduction of illegal timber removal and overgrazing.

d. Planned Development

In the Second Five Year Development Plan the target was to

plant 24,733 hectares of forests--85 per cent of this target was achieved. Up to 1973, some 39,144 hectares had been planted.

Forestry objectives during the Third Five Year Plan[1/] are as follows:

--Afforestation of hillsides, river sides and streams.

--Expanding the supply of seedlings and various types of trees for the afforestation programs especially in regions where there are no forests of any significance.

--Enforcing various bylaws on forests in order to prevent indiscriminate felling and burning of indigenous forests.

--Cautiously increasing the exploitation of forests to ensure sufficient availability of timber, logs and other products and thereby reduce the importation of such products.

--Widespread tree planting for water preservation, prevention of soil erosion and procurement of building poles and firewood. Nurseries for seedlings will be started in villages to enable easy distribution of seedlings to be planted in school areas, hospital areas and in parastatal farms in the regions.

--Requiring every village to develop its own forest.

--Developing quality wood forests for the drying of cash crops (e.g., tobacco and cocoa) and for making burnt bricks will be stressed.

--Organizing and conducting afforestation educational programs for villages.

The implications of these objectives on the transportation of supplies, personnel, and output will be felt during the next decade. These impacts will be most felt in the timber development and production in the Singida and Kilimanjaro regions. Continuing development of small fuel wood and charcoal industries at the village level will also benefit from the improvement of the rural road system.

e. Impact of Improved Rural Access Roads

At the current level of forestry product development, it is difficult to quantify the linkage between forest harvests and the rural roads. It is clear, however, that the attainment of reforestation, extension services, and proper utilization of forest

1/ Third Five Year Plan for Economic and Social Development, United Republic of Tanzania, Vol. 1, 1976.

products will be enhanced through the improvement of roads.

Much of the timber production is used as local input to the small industries within the administrative divisions and districts of production. The types of non-factory sector industries which employ timber include sawmills, furniture manufacturers, and construction firms. As these subsectors develop, the requirements for transport will increase.

3. Fishing

a. Introduction

Tanzania has 58,824 square kilometers of rivers and dams, and 800 kilometers of coastline. As for fishing, 20 per cent of the catch comes from the Indian Ocean, 40 per cent from Lake Victoria, and the rest from Nyumba ya Mungu Dam, Lakes Nyasa, Tanganyika, Rukwa, Kitangiri, as well as other lakes, rivers and dams. Much of the Indian Ocean fish potential has not yet been tapped.

The Second Five Year Development Plan targets with respect to fishing activities were: (1) to fish and process as much fish as possible for local consumption as well as for export; (2) to carry out research with a view to ascertain the fish potential in Tanzanian waters, as well as to widen the knowledge on fishing and fish processing; (3) to protect marine and fresh water fish from destructive fishing; and (4) to protect marine parks and reserves for tourist purposes, to conserve marine resources, and to demonstrate to the villagers modern fishing methods.

Ujamaa fishing villages were started in 1971 and 1972. At the end of the Second Five Year Plan, there were 28 such villages. The services provided for fishing activities included the construction of village fishing units, the provision of 8 boat-building yards, 6 fish-receiving stations which were started in Mwanza, Lindi, Mtwara, Kigoma and Tanga regions. The objective in starting village fishing units is to disseminate modern fishing capacity for their own benefit.

The Pare District Development Corporation (PADECO), located in Same district, in cooperation with Arusha and Moshi District Development Corporations, has established a fishing company

responsible for both fishing and distributing fish from Nyumba ya Munga Dam. At the national level, the Tanzania Fishing Company (TAFICO) was established to advance economic and commercial fishing.

Under the decentralization program, regional authorities have the responsibility of running fishing projects by establishing fishing villages and fishing companies. District Development Corporations are also vital in this area. They undertake fishing projects provided that these projects are economically viable.

b. Fish Production and Sales

A regional summary of the reported fish production is shown as Table V-42 by district and region in terms of metric tons of production and the value of fish production (average sale price in thousands of T/shs). The comparative statistics were developed for specific stream, lake, and dam production data for the years 1977 and 1978. These average yield and production figures should be considered as representative and useful for relative comparisons only, since the history of production appears to exhibit extreme variations of the period 1974 through 1979. This phenomenon is attributed to poor reporting and monitoring, periodic uncontrolled fish farming, and periodic ecologic imbalances.

It should be noted that of the 9,691 metric tons in the study area, the percentage of fish production in 1977-78 was 74.0, 16.4, and 9.6 per cent for the Kilimanjaro, Singida and Dodoma regions, respectively.

Fish production and values for each of the three study regions with respect to district and administrative division are presented in Tables V-43 through V-45.

Within the Dodoma region the majority--72 per cent--of the production value is within the Dodoma Rural district. The Iramba district represents 96 per cent of the fish production for the Singida region, and the Mwanga district represents 90 per cent of the fish production for the two districts of the Kilimanjaro region. It is evident that the distribution of fish production is extremely uneven throughout the areas. This is because of discontinuities in the number of landfill dams, inadequacy of water supplies, lack of breeding stations, and inadequate quantities of fish food.

TABLE V-42
FISH PRODUCTION SALES SUMMARY, 1977-1978

Region	District	Fish Production Sales (Metric Tons)	Fish Sales Value (000 T/shs)
Dodoma	Dodoma Rural	673	2,311
	Dodoma Urban	177	356
	Mpwapwa	-	-
	Kondoa	86	288
	Total	936	2,955
Singida	Singida Rural	16	51
	Singida Urban	-	-
	Iramba	1,522	4,809
	Manyoni	43	136
	Total	1,581	4,996
Kiliman-jaro 1/	Same	690	2,180
	Mwanga	6,484	20,489
	Total	7,174	22,669
Total		9,691	30,620

1/ Same and Mwanga districts of Kilimanjaro region.

Source: Fishing Division, District Natural Resources Development Office.

TABLE V-43
FISH PRODUCTION SALES, DODOMA REGION, 1977-1978

District	Administrative Division		Fish Production Sales (Metric Tons)	Fish Sales Value (000 T/shs)
Dodoma Rural				
	Itiso		2	6
	Chamwino		16	35
	Chipanga		95	195
	Bahi		510	1,975
	Makangwa		50	100
		Total	673	2,311
Dodoma Urban				
	Hombolo		177	356
		Total	177	356
Mpwapwa			-	-
Kondoa				
	Pahi		16	39
	Goima		70	249
		Total	86	288
Total			936	2,955

Source: Fishing Division, District Natural Resources Development Office.

TABLE V-44
FISH PRODUCTION SALES, SINGIDA REGION, 1977-1978

District	Administrative Division	Fish Production Sales (Metric Tons)	Fish Sales Value (000 T/shs)
Singida Rural			
	Mgori	16	5
	Total	16	5
Singida Urban		-	-
Iramba			
	Kisiriri	800	2,528
	Shelui	722	2,281
	Total	1,522	4,809
Manyoni			
	Kintinku	29	92
	Nkonko	14	44
	Total	43	136
Total		1,581	4,996

Source: Fishing Division, District Natural Resources Development Office.

TABLE V-45
FISH PRODUCTION SALES, KILIMANJARO REGION, 1977-1978[1/]

District	Administrative Division		Fish Production Sales (Metric Tons)	Fish Sales Value (000 T/shs)
Same	Ndungo		690	2,180
		Total	690	2,180
Mwanga	Mwanga		3,480	10,997
	Lembeni		3,004	9,492
		Total	6,484	20,489
Total			7,174	22,669

1/ Same and Mwanga districts of Kilimanjaro region.

Source: Fishing Division, District Natural Resources Development Office.

The average fish production statistic was employed in the comparative evaluation of administrative divisions as part of the prioritization and analysis of rural road improvement potentials.

It should be noted that approximately 10 per cent of the national fresh water catch is produced in the study regions. The Mwanga district represents the majority of the production (see Table V-45).

The Dodoma region has a very low potential for the development of fresh water fishing. At present the fish production is confined to the four 10-acre landfill dams at Hombolo, Nondwa, Kisaki and Dabalo dam sites. Fish are also produced at the Bubu River and the 400-acre Bahi swamp. The marketing of fish within the region and outside the region is not organized at present.

There are six fish ponds in Kondoa town and a small pond at the Tubugwe Ujamaa village in the Mwapwa district.

The Dodoma Region Interim Development Plan includes assistance to the Mtera Dam Fisheries Project which is expected to produce 15,100 metric tons of fish after 1982. The Government of Tanzania is presently constructing a large reservoir at Mtera which will cover an area of approximately 600 km^2. It is expected that fishing will be done by local inhabitants for subsistence and organized harvesting (in cooperatives) for sale at distant markets.

Lake Kitangiri is the only major fish producer in the Iramba district and the Singida region as a whole. There are, however, a number of small dams which contribute to the regions' fish production. The river waters, which are seasonal, bring fish nutrients and raise the water in the lake and small dams. The dams are located in Urughu, Mampanta, Meli, Ndago, Mwadoivembo, Iguguno, Kisiriri, Iambi, Gumenga, and the Magereza Dam in the Kiomboi area. Most of these dams need to be expanded, since few have been stocked and transport costs are high. There are plans to expand the local fish dams up to 10 hectares each to increase water volumes and thereby increase fish production.

Over 90 per cent of the fish production in the Same and Mwanga districts of the Kilimanjaro region is from the Mwanga and Lembeni districts of the Mwanga district.

There are plans to reduce the silting problems at the Ngurunga Dam and the Dindira Dam. With the reduction of silting, the volume of water collected will increase and provide potential for fish production.

c. Transportation Requirements

Most of the yield from Lake Kitangiri in the Iramba district is transported by road to Dar es Salaam, Mbeya, Iringa, Nzega, Singida, Shinyanga, Tanga and other small markets in the villages within the district.

The poor condition of the feeder road from Lake Kitangiri to Kiomboi hinders the transport of fish out of the area. At present, it costs T/shs 10 per ton/km. to transport fish from the fishing sites to Kiomboi. With the improvement of feeder roads, the site could more easily be served by advisory services, stocking could be increased, fish production could be increased, and the cost of transport could be reduced.

About 40 per cent of the fish production from the Ndungu landfill dam in the Same district is consumed locally, while the remainder is transported by truck to Dar es Salaam, Tanga, and Morogoro. The production of the Ndungo Dam and Lake Mwanga is shipped to Dar es Salaam and Zambia. The vast majority of the fish from these district sites is dried prior to shipment.

d. Planned Development

The fishing objectives during the Third Five Year Plan[1/] include the following:

--Expansion and consolidation of village fishing units and Ujamaa fishing villages will be undertaken by giving expert advice and supplying equipment necessary for modern fishing development. The number of fish receiving stations will be increased wherever it will be deemed necessary. District Development Corporations engaged in fishing will, in addition to fishing, be concerned with the running of fish receiving and preservation units as well.

--Wherever possible fishing dams will be built and existing ones will be expanded. Ujamaa villages will be involved in the implementation of this program, especially in regions where there are no lakes or large rivers. The program will eventually enable villagers in such areas to obtain fish protein. Expert training on fish breeding will be given to the implementers of the program.

1/ Third Five Year Development Plan for Economic and Social Development, United Republic of Tanzania, Vol. 1, 1976.

--Emphasis on fish processing will continue. Attention will also be given to the efficient distribution of fish in the country, from fish-abundant to fish-deficient areas.

--The Tanzania Fishing Company (TAFICO), together with DDC's, will draw up plans for the expansion of modern boat-building yards to increase the country's capacity for boat-making and thus eliminate the problem of boat shortages. These corporations will also ensure that modern fishing equipment is available in sufficient quantities when required.

e. Impact of Improved Roads

Contacts with the functional managers for the fishing sub-sector of natural resource development at the district level produced the observation that the transport of fresh, smoked, and dried fish is directly tied to the condition of the rural access roads. The current transport problems in the high production areas of Lake Kitangiri, the unwillingness of commercial operators to travel on rural roads (due to road conditions), and the high cost of transport throughout the study regions should be reduced through the improvement of the rural roads. As landfill dams are constructed and stocked in the administrative divisions, the need for improved access will become evident for dam maintenance and stocking, production (fish farming) control and monitoring, transport of fresh water produce, and support of small industry development in the proximity of the resource.

The goal to develop self-sufficiency at the village and district level, and to increase the per capita protein intake, is directly related to the development of the local fishing sub-sector. This goal is in turn tied directly to the infrastructure--specifically the availability of roads.

VI

VI. PROJECT SELECTION AND PRIORITIZATION

A. Introduction

Field investigations by the consultant's engineers, including discussions and followup work with the Regional and District Engineers, revealed that the three study regions contain approximately 7,095 kilometers of rural access roads, excluding trunk roads. This total road kilometerage is distributed throughout the nine districts and 54 administrative divisions which are to be found in the study regions--Dodoma, Singida, and the east portion of Kilimanjaro.

The District Engineers prepared a list of priorities by individual road projects for their respective districts. These listings totaled 4,336 kilometers of the above 7,095 kilometers of all rural access roads in the three study areas. The priority listings were reviewed by the consultant's engineers and road inspections made of the majority of listed roads. One hundred forty-five individual roads make up the 4,336 kilometers, with an average road length of 30.5 kilometers and a top range of 98 kilometers. A minimum of one road project is listed for each administrative division, while the average is 2.6.

Early in the study, the decision was made to develop a project selection and prioritization scheme based upon the smallest political unit for which data were possibly available or could be developed within the time frame of the project study. The administrative division was selected for this purpose, and subsequent investigations, including extensive field work, confirmed the desirability of its selection, particularly in view of the multiplicity and geographical dispersion of the road projects as later determined by the study engineers.

By establishing priorities for each of the 54 administrative divisions, in effect, road priorities had also been established for the road clusters within each division as compared with all other divisions of the region.

The anticipated large number of road projects in over 4,000 kilometers of roads precluded any consideration being given to an individual road by road analysis in view of the manpower, financial and time constraints of this project. This decision was also forcefully brought home when it was determined after arrival in Tanzania that there were no historical or existing traffic data for any of the rural access roads in the study areas.

The priority methodology of the present study utilizes economic, social

and cost data for the development of factor values which are assessed on the basis of rating scales. Weights are then applied to the ratings, and the weighted ratings are totaled to determine the priorities among the 54 administrative divisions. The division priorities, which were determined on a regional basis, were also utilized in determining priorities among the districts of the regions.

Priorities of roads within each division were then determined by giving consideration to listings of road priorities compiled by each of the District Engineers, and to the factor of location in terms of an orderly and efficient process in the road rehabilitation program.

B. Preliminary Screening

1. Development of Criteria

As an initial preliminary screening step for the purpose of eliminating, at the very beginning, the least likely road candidates for rehabilitation, the consultant established the following selection criteria for the rural access roads:

a. Rural access roads, for the purpose of this study, are defined as including all rural roads, except trunk roads, located within each of the study regions (Dodoma, Singida, and the Same and Mwanga districts of Kilimanjaro region).

b. Roads which are either less than six kilometers in length or within six kilometers of roughly parallel existing roads which already have reasonable access are automatically excluded from selection. (with minor exceptions.)

c. The road proposed for rehabilitation must connect to an all-weather road or to a rural access road that is a likely candidate for rehabilitation. The connecting roads, in turn, should lead to an administrative and/or marketing center.

The application of these criteria eliminated a small number of roads.

C. Development of Preliminary Economic and Social Indicators

Preliminary compilations, computations, and evaluations were made of a few key indicators from the mass of economic and social data gathered during the five-week field trip. The purpose of these preliminary indicators was to allow the engineers to return to the field as quickly as possible (because of the very tight time schedule under which the team was operating) for followup work based upon a preliminary selection of the road groups

among the 54 administrative divisions as the most likely candidates for rehabilitation.

During this phase of the project, data were completed by the economists on population, food and cash crop sales, and livestock population. These key indicators were sufficient at this point to allow a reasonable indication of the most promising administrative divisions with regard to those particular factors. The chief economist and the engineers then reviewed the divisional data and selected from the list of road projects provided by the District Engineers a preliminary list of likely candidates for improvement. The proposed roads on these lists were then examined in the field and consultations held with the Regional and District Engineers regarding their revised priority listings.

D. Development of the Rating Scheme

The second and final phase of the project selection and prioritization process consisted of the development of a formalized rating scheme which incorporated the technique for a final screening of the road groups within each of the administrative divisions.

Data on the preliminary economic and social indicators (population, food and cash crop sales) were finalized during this second phase. In addition, the livestock population census indicator was replaced with livestock market sales upon completion of the data computations for the latter. Other economic and social criteria were developed from the field data, and followup work in Dar es Salaam. These included annual production of forest products, annual production of fish, small industry sales and agricultural potential.

On the social criterion side, population density, education, health and rural water supply were added to the original key social indicator, population.

To summarize, a total of six economic, five social and one cost criterion were developed in the final phase of the study as shown in Table VI-1.

The initial relative weights assigned to each of the economic and social factors in the preliminary draft report were subsequently reviewed as part of the overall report review by US/AID staff members in Washington, D.C., Tanzania and Kenya. As a result of suggestions received in these reviews, the consultant has made one major change and other minor changes in the factor weights and has added a new factor, road construction costs.

The major change consisted of reducing the factor weight of annual average crop sales from 35% to 17% and of increasing agricultural potential from 10% to 25%. This change is essentially a trade off with greater emphasis being placed upon agricultural potential information derived from map interpretation.

Other changes were to reduce the factor weights of annual average livestock sales from 10% to 3%, and that of population density from 10% to 4%. The reduction in the livestock weight reflects the general consensus of livestock experts in Tanzania that most of the cattle in future years will continue to be driven to market, rather than transported by truck. The reduction in the population density weight is in recognition of the need for a greater benefit from the road improvements to be attributable to the total population in contrast to the density of the population. Both of these factor weights were thus likely candidates for reduction especially in view of the necessity for adding the additional factor of road construction costs.

Health was also reduced by 2 percentage points (from 9% to 7%), and education and rural water supply by 1 percentage point (from 7% to 6% for education and from 4% to 3% for water supply).

In addition, a third criterion was developed, that of road construction costs. From previously gathered engineering data, the consultant calculated average construction costs per kilometer for a series of typical road types in each of the three regions. These construction costs were then identified with the individual roads in the three regions which had been selected on a preliminary basis for rehabilitation. The percentage of road length of each project was then estimated for the particular administrative division for divisions. (For more detail on the construction costs see Chapter VII.)

From the above data, the consultant calculated the total road construction costs and a weighted average of these costs for each of the administrative divisions in the three regions. (See Appendix Tables AVI-1, page 1 through 9.)

The data gathering for the above criteria emphasized multiple years whenever possible, and the most current data available. Food and cash crops are based upon averages of the past three years; livestock, forest products and fish are two-year averages; while small industry, population, education and health are for one year, 1978. Data on agricultural potential are a composite of information from 1967, 1976 and 1980. Similarly, for rural water supply, base data are from master plans for the three regions, completed between the three-year period, 1976-1978.

The measurement units and measuring parameters (range of factor values and common rating scale) are shown in Table VI-1. A major advantage of this type of rating scheme is that it permits the adding together of "oranges and apples," diverse elements of economic, social and cost aspects regardless of their comparability since in the end all such elements are assigned factor values and weights and thus can be totaled.

TABLE VI-1

RATING SCHEME FOR ADMINISTRATIVE DIVISIONS OF RURAL ACCESS ROADS

Criterion		Factor	Measurement Units	Measuring Range of Factor Values	Parameters Common Rating Scale
I. Economic Activity	1.	Annual Average Crop Sales	Metric tons of agricultural sales	0-11,000	0-100
	2.	Annual Average Live-stock Sales	No. of cattle equivalent units 1/	0-6,900	0-100
	3.	Annual Production Forest Products	M^3 of output	0-4,500	0-100
	4.	Annual Production of Fish	Metric tons	0-3,500	0-100
	5.	Annual Small Industry Sales	Thousands of T/shs	0-3,900	0-100
	6.	Agricultural Potential	Soils capability for agriculture	1-High (100) 2-Medium (55) 3-Low (10)	25-100
II. Social Aspects	7.	Population	Number of persons	13,000-66,000	20-100
	8.	Population Density	Persons/Km^2	1-305	0-100
	9.	Education	Student/Teacher ratio	64/1-34/1	3-100
	10.	Health	Health facilities to population ratio	1/15,000-1/700	1-100
	11.	Rural Water Supply	Adequacy of supply	5-1	20-100
III. Cost Aspects	12.	Road Construction	Weighted Average Cost/ Km.-T/shs	39,300-21,000	12-100

1/ Sheep and goats were converted to cattle equivalent units on the basis of a ratio of 5 goats or 5 sheep to 1 head of cattle.

E. Determination of Relative Weights for Factors

Determination of the relative weights to be assigned the various economic and social factors is a basic element of the entire rating scheme. In recognition of this fact, and in accordance with the contract provisions, the consultant sought the assistance of officials of USAID/Tanzania and the Tanzanian Government in performing this essential task. Attempts were made through USAID/Tanzania to arrange for a meeting with the Prime Minister's Office in Dodoma during the last fifteen days of the consultant's stay in Tanzania. At that time, the entire methodology with accompanying data tables had been drawn up for review purposes. Subsequently, USAID/Tanzania officials informed the consultant that they had received the following report from the Prime Minister's Office:

1. The Prime Minister's Office was heavily engaged in budget hearings, which precluded arrangements for a meeting, and
2. Officials of the Prime Minister's Office did not believe that they could contribute to the determination of the relative weights, since they lacked the specific knowledge about the relative importance of these various factors to the regional economies. They further added that since the study team had been involved in an extensive field survey and had discussed these economic and social factors with knowledgeable persons throughout the regions of concern and elsewhere, the team members were in a much better position than the Prime Minister's Office personally to make reasonable judgments about the relative weights to be assigned each factor.

In view of this report from the Prime Minister's Office, USAID/Tanzania officials also reported to the consultant that they did not feel that they were in a position to contribute to the weight-making process since they had insufficient knowledge about the relative importance of these many factors to the regional economies, and to the administrative divisions in particular.

This position of USAID and Tanzanian Government officials is understandable to consultant, since the present study is the first time that detailed data of the scope contained in the study (multiple economic and social indicators at the administrative division level) had been developed in Tanzania. It was then agreed in a meeting between the consultant and USAID/Tanzania officials that the consultant would fix the weights based upon his prior experience in such studies, and the knowledge which he had gained in Tanzania through the intensive field surveys, and from other sources.

The step-by-step evaluation and weight assignment of each factor resulted in a combined weight of 50 per cent for the economic activity 30 per cent for the social aspects and 20 per cent for the cost aspects (Table VI-2).

F. Development of Input Matrix

The input data matrix shown in Table VI-3 reflects the availability of the data. All of the data contained in the Table have been previously discussed in the report, and thus no further explanation is needed here, other than to state that all of the quantitative output data (crop and livestock, forest products, fish, industry) population, health facilities and road construction costs have been rounded to the nearest whole number.

G. Ratings of Administrative Divisions and Application of Weights

Calculations of the ratings for each factor and by administrative division are shown in Table VI-4. The ratings are calculated as follows:

1. Factor No. 1, Annual Average Crop Sales, has a range in factor values from 0 to 11,000 metric tons.
2. Itiso division in Dodoma Rural district has annual average crop sales of 1,500 metric tons.
3. The rating for Itiso division is thus calculated:

   1,500 divided by 11,000 = 13.6% or rounded to 14%.

   For the purpose of ease in later totaling, this 14% is shown as a whole number.

TABLE VI-2

RELATIVE WEIGHTS FOR CRITERIA AND FACTORS

Criterion (Weight)	Factor (No. and Description)	Factor Weight (Percentage)
I. Economic Activity (50)	1. Annual Average Crop Sales	17
	2. Annual Average Livestock Sales	3
	3. Annual Production Forest Products	2
	4. Annual Production of Fish	1
	5. Annual Small Industry Sales	2
	6. Agricultural Potential	25
II. Social Aspects (30)	7. Population	10
	8. Population Density	4
	9. Education	6
	10. Health	7
	11. Rural Water Supply	3
III. Cost Aspects (20)	12. Road Construction	20
	Total	100

TABLE VI-3

INPUT MATRIX FOR ADMINISTRATIVE DIVISIONS OF RURAL ACCESS ROADS

FACTORS 1/

DISTRICT AND DIVISION	Annual Average Crop Sales	Annual Average Livestock Sales	Annual Forest Products and Production	Annual Fish Production	Annual Small Industry Sales	Agricultural Potential	Population	Population Density	Education Student/ Teacher Ratio	Health Facilities to Population/ to	Rural Water Supply	Road Construction Costs
	1	2	3	4	5	6	7	8	9	10	11	12
Dodoma Rural												
[illegible]	1,500	600	1,400	0	2,800	2	29,600	9	48/1	1/3,700	4	23,700
[illegible]	1,000	1,200	700	0	-	2	38,100	34	48/1	1/5,400	2	24,300
[illegible]	500	100	-	-	1,000	3	40,300	50	45/1	1/1,700	3	24,700
[illegible]	200	2,000	-	-	-	3	36,200	20	43/1	1/2,600	3	23,300
[illegible]	300	1,800	-	100	-	2	31,900	18	43/1	1/3,200	3	22,600
[illegible]	100	2,200	700	500	-	3	35,300	25	43/1	1/5,000	3	25,000
[illegible]	900	700	700	100	-	2	28,500	13	50/1	1/4,100	3	24,400
[illegible]	200	3,800	-	-	-	2	36,800	22	42/1	1/3,700	3	25,300
Dodoma Urban												
[illegible]	200	6,900	1,300	200	0	2	33,600	305	40/1	1/1,200	2	24,300
[illegible]	100	1,100	-	-	-	2	24,600	204	44/1	1/12,300	2	25,100
[illegible]	0	-	400	-	-	2	22,300	248	37/1	1/11,200	2	22,200
[illegible]	200	-	-	-	-	3	15,700	199	36/1	1/4,500	2	23,800
Mpwapwa												
[illegible]	2,700	1,900	100	-	3,900	3	65,200	38	47/1	1/2,600	2	23,500
[illegible]	5,700	900	100	-	-	3	35,800	24	55/1	1/3,000	1	23,200
[illegible]	6,700	100	200	-	0	1	50,400	31	49/1	1/4,200	2	23,000
[illegible]	10,600	300	-	-	-	1	33,200	24	51/1	1/6,600	2	21,300
[illegible]	4,600	400	0	-	-	2	38,700	16	55/1	1/3,500	1	22,000
[illegible]	1,200	900	100	-	-	3	38,100	13	56/1	1/3,000	2	24,400
Kondoa												
[illegible]	1,000	-	-	-	1,800	3	31,500	61	42/1	1/1,900	5	23,500
[illegible]	5,100	3,300	-	-	-	2	47,100	70	48/1	1/2,800	3	25,200
[illegible]	0	2,700	-	-	-	3	14,700	8	45/1	1/2,900	2	22,900
[illegible]	100	2,600	600	-	-	3	26,000	10	50/1	1/2,600	5	24,500
[illegible]	5,100	700	300	0	0	1	51,200	16	42/1	1/4,300	3	26,000
[illegible]	3,900	200	300	100	-	2	28,000	12	50/1	1/2,100	5	25,200
[illegible]	5,300	1,000	-	-	-	2	44,700	38	43/1	1/4,100	2	39,300
[illegible]	1,600	500	-	-	-	3	32,000	32	45/1	1/3,000	5	25,500
Singida Rural												
[illegible]	200	1,000	2,600	-	600	3	24,600	9	38/1	1/6,100	5	24,200
[illegible]	300	2,200	700	-	800	2	29,200	8	40/1	1/2,700	4	23,500
[illegible]	300	800	-	-	600	2	25,200	32	37/1	1/1,200	4	23,900
[illegible]	1,000	4,700	-	-	2,200	1	58,100	18	36/1	1/1,900	5	23,600
[illegible]	300	600	500	0	200	3	22,100	18	34/1	1/2,800	5	26,600
[illegible]	1,800	900	900	-	700	1	54,400	33	37/1	1/4,900	3	27,700
Iramba												
[illegible]	300	1,500	800	-	200	3	31,900	16	43/1	1/2,900	1	23,900
[illegible]	1,800	1,700	-	-	500	1	43,200	51	46/1	1/2,300	4	23,400
[illegible]	500	2,000	-	-	600	2	27,100	25	43/1	1/9,000	2	22,800
[illegible]	300	1,900	600	-	0	3	29,700	53	42/1	1/14,900	2	22,700
[illegible]	100	5,700	-	800	600	2	36,500	37	40/1	1/1,800	3	22,000
[illegible]	300	5,400	1,900	-	200	2	37,600	29	44/1	1/3,[illegible]0	2	24,600
[illegible]	400	4,600	-	700	50	3	35,900	34	41/1	1/4,000	2	23,[illegible]00
Manyoni												
Manyoni	-	2,100	-	-	300	2	15,400	27	34/1	1/700	3	21,100
[illegible]	500	2,900	4,500	-	400	2	17,900	1	36/1	1/2,200	1	22,600
Manyoni Vijijini	-	400	-	-	-	2	13,200	22	40/1	1/6,600	1	21,000
Kintinku	0	2,100	-	0	-	2	18,400	9	43/1	1/2,300	1	22,[illegible]00
Nkonko	500	1,000	4,500	0	800	2	37,500	4	46/1	1/1,500	3	23,800

TABLE VI-3

INPUT MATRIX FOR ADMINISTRATIVE DIVISIONS OF RURAL ACCESS ROADS

FACTORS 1/

DISTRICT AND DIVISION	Annual Average Crop Sales	Annual Average Livestock Sales	Annual Forest Products and Production	Annual Fish Production	Annual Small Industry Sales	Agricultural Potential	Population	Population Density	Education Student/Teacher Ratio	Health Facilities to Population/Ratio	Rural Water Supply	Road Construction Costs
	1	2	3	4	5	6	7	8	9	10	11	12
Saze												
Saze	200	800	-	-	2,700	2	15,100	10	56/1	1/800	1	25,900
Mwabe Mbaga	700	1,000	-	-	1,000	2	26,400	13	57/1	1/2,600	3	30,400
Gonja	1,200	-	1,300	-	1,200	2	17,800	71	55/1	1/4,400	1	30,900
Chizze/Suji	400	3,100	2,700	-	800	2	23,500	15	53/1	1/1,600	1	26,700
Mazia Vunta	0	600	-	-	0	3	23,700	108	56/1	1/3,400	5	32,400
Nkoma	300	-	-	690	400	2	27,200	31	60/1	1/3,000	5	30,200
Mwanza												
Ozondo	1,400	-	-	-	0	1	25,000	109	56/1	1/2,300	1	32,700
Usangi	100	1,500	-	-	100	2	20,000	44	57/1	1/1,200	1	28,100
Mwanza	100	-	-	3,500	400	3	13,700	29	58/1	1/1,700	3	23,500
Ikoteni	100	-	40	3,000	700	3	14,800	87	62/1	1/3,000	5	31,370

1/ See Table VI-1 for description of factors, measurement units, range of factor values and rating scale.

Note: Data are rounded to the nearest hundred units. A Zero indicates that production was less than 50 units, while a Dash indicates no production.

TABLE VI-4

RATINGS OF ADMINISTRATIVE DIVISIONS OF RURAL ACCESS ROADS BASED ON

COMMON RATING SCALE

DISTRICT AND DIVISION	FACTOR NUMBERS 1/											
	1	2	3	4	5	6	7	8	9	10	11	12
	RATINGS											
DODOMA RURAL												
Itiso	14	9	31	0	72	55	45	3	57	27	40	16
Chamwino	9	16	15	0	--	55	58	11	57	19	80	83
Mvumi	5	1	-	-	26	25	61	16	66	59	60	82
Mvitikira	2	29	-	-	-	25	55	7	72	38	60	86
Chipanga	3	26	-	3	-	55	48	6	72	31	60	92
Pahi	1	32	15	14	-	25	53	8	72	20	60	80
Makanya	8	10	15	3	-	55	43	4	51	24	60	83
Mundemu	2	41	-	-	-	55	56	7	75	27	60	79
DODOMA URBAN												
Hombolo	2	100	29	6	0	55	51	100	81	83	80	84
Kikombo	1	16	-	-	-	55	37	67	69	8	80	80
Nala	0	-	9	-	-	55	34	81	90	9	80	90
Mpunguzi	2	-	-	-	-	25	24	65	93	22	80	87
MPWAPWA												
Mpwapwa	25	28	2	-	100	25	99	12	60	36	80	88
Kibakwe	52	13	2	-	-	25	54	8	36	33	100	89
Mlali	79	1	4	-	0	100	76	10	54	24	80	90
Zoissa	98	4	-	-	-	100	50	8	48	15	80	95
Kongwa	42	6	0	-	-	55	59	5	36	29	100	95
Rudi	11	13	2	-	-	25	58	4	33	33	80	83
KONDOA												
Kondoa	9	-	-	-	46	25	48	20	75	53	20	88
Mondo	46	48	-	-	-	55	72	23	57	36	60	65
Farkwa	0	39	-	-	-	25	22	3	66	34	80	90
Kwamtoro	1	41	13	-	-	25	39	3	51	38	20	83
Pahi	46	10	7	0	0	100	79	5	75	23	60	75
Goima	35	2	7	3	-	55	42	4	51	43	20	76
Bereko	48	14	-	-	-	55	68	12	72	24	60	12
Kolo	16	7	-	-	-	25	48	10	66	12	80	88
SINGIDA RURAL												
Ihanja	2	14	58	-	15	25	37	3	87	16	20	84
Ikungi	3	32	16	-	21	55	44	3	81	37	40	88
Mungaa	3	12	-	-	15	55	38	10	90	83	40	86
Mtinko	9	68	-	-	56	100	88	6	93	53	20	87
Mgori	3	9	11	0	5	25	33	6	100	36	20	72
Ilongero	16	13	20	-	18	100	82	11	90	20	60	67

1/ See Table VI-1 for description of factors, measurement units, range of factor values and rating scale.

NOTE: Data are rounded to the Zero nearest hundred unit. A 0 indicates that production was less than 50 units, while a Dash indicates no production.

Headings appear on Table VI-3.

TABLE VI-4

RATINGS OF ADMINISTRATIVE DIVISIONS OF RURAL ACCESS ROADS BASED ON

COMMON RATING SCALE

DISTRICT AND DIVISION	FACTOR NUMBERS 1/											
	1	2	3	4	5	6	7	8	9	10	11	12
	RATINGS											
IRAMBA												
Kirumi	3	22	18	-	5	25	48	5	72	34	100	86
Mduguti	62	25	-	-	14	100	65	17	63	43	40	86
Kinyangiri	5	29	-	-	15	55	41	8	72	11	80	91
Kinampanda	3	28	13	-	0	25	45	17	75	1	80	91
Kisiriri	1	83	-	23	15	55	55	12	81	56	60	95
Ndago	3	78	42	-	5	55	57	10	69	26	80	82
Shelui	4	67	-	20	1	55	54	11	78	25	80	86
MANYONI												
Manyoni	-	30	-	-	8	55	23	9	100	100	60	99
Itigi	5	42	100	-	10	55	27	0	93	45	100	92
Manyoni Vijijini	-	6	-	-	-	55	20	7	81	15	100	100
Kintinku	0	30	-	0	-	55	36	3	72	56	100	90
Mkonko	5	14	100	0	21	55	57	1	63	67	60	86
SAME												
Same	2	12	-	-	69	55	23	3	33	97	100	77
Mvembe Mbega	6	14	-	-	26	55	40	4	30	38	60	55
Gonja	11		29	-	31	55	27	23	36	23	100	52
Chome/Suji	4	45	60	-	21	55	36	5	42	56	100	72
Mamba Vunta	0	9	-	-	0	25	36	35	33	29	20	43
Mlungu	3	-	-	20	10	55	41	10	15	33	20	56
MWANZA												
Ugweno	13	-	-	-	0	100	38	36	33	43	100	44
Usangi	1	22	-	-	3	55	30	14	30	33	100	66
Mwanga	1	-	-	-	10	25	21	10	27	59	60	88
Lembeni	1	-	1	86	18	25	22	29	9	33	20	50

1/ See Table VI-1 for description of factors, measurement units, range of factor values and rating scale.

NOTE: Data are rounded to the Zero nearest hundred unit. A 0 indicates that production was less than 50 units, while a Dash indicates no production.

Headings appear on Table VI-3.

The weighted ratings shown in Table VI-5 are merely the application of the assigned weights applied to each of the ratings shown in Table VI-4. The total of the weighted ratings for each division within the entire study area is shown in the last column of Table VI-5.

H. Priority Rankings

For the purposes of the road rehabilitation and maintenance program, the priority rankings of the administrative divisions are by regions. This decision was based upon the fact that the region will be the key element in the road program in which Dodoma region will have two teams for rehabilitation and maintenance, while Singida region and the Same/Mwanga districts of Kilimanjaro region will each have one team.

The top rankings within each region show that for Dodoma region the first five divisions are located in three of the four districts, while in Singida region, the top-ranked five divisions are in two of the three districts (Table VI-6). Similarly, for Same and Mwanga districts, the top five divisions are split with three in the Same district and two in Mwanga district.

A comparison of priority markings by districts within each region based upon a totaling of the raw social/economic/cost scores for the divisions within each district show in the tabulation below that for Dodoma region, Dodoma Rural is first, Kondoa is second by a difference of one point, Mpwapwa is third, and Dodoma Urban is fourth. For the Singida region, Iramba is first, Singida Rural second, and Manyoni third, while in Kilimanjaro study area, Same is first and Mwanga is second.

When average scores by districts are calculated (since the number of divisions within each district varies from four to eight), some changes occur in the district rankings. In particular, Mpwapwa with six divisions moves from third to first place, and Dodoma Urban moves from fourth to second place. Dodoma Rural and Kondoa end up with identical average scores. In the Singida region, the average score calculations have no impact on the rankings by districts. In the Kilimanjaro region, the average score for Mwanga District is slightly higher than for Same District (see the tabulation at the end of this section).

A comparison of the consultant's priority rankings of the administrative divisions with the District Engineers' individual road priorities within each division or between two or more divisions, shows a surprisingly close coordination for most of the divisions and the districts (Table VI-7). A

TABLE VI-5

WEIGHTED RATINGS OF ADMINISTRATIVE DIVISIONS OF RURAL ACCESS ROADS

DISTRICT AND DIVISION	FACTOR NUMBER AND WEIGHT 1/											
	1	2	3	4	5	6	7	8	9	10	11	12
	WEIGHT											
	0.17	0.03	0.02	0.01	0.02	0.25	0.10	0.04	0.06	0.07	0.08	0.20
DODOMA RURAL												
Itiso	2.4	0.3	0.6	0	1.4	13.8	4.5	0.1	3.4	1.9	1.2	17.2
Chamwino	1.5	0.5	0.3	0	-	13.8	5.8	0.4	3.4	1.3	2.4	16.6
Mvumi	0.9	2/	-	-	0.5	6.3	6.1	0.6	4.0	4.1	1.8	16.4
Mwitikira	0.3	0.9	-	-	-	6.3	5.5	0.3	4.3	2.7	1.8	17.2
Chipanga	0.5	0.8	-	2/	-	13.8	4.8	0.2	4.3	2.2	1.8	18.4
Bahi	0.2	1.0	0.3	0.1	-	6.3	5.3	0.3	4.3	1.4	1.8	16.0
Mzakwa	1.4	0.3	0.3	2/	-	13.8	4.3	0.2	3.1	1.7	1.8	16.6
Mundemu	0.3	1.2	-	-	-	13.8	5.6	0.3	4.5	1.9	1.8	15.8
DODOMA URBAN												
Hombolo	0.3	3.0	0.6	0.1	0	13.8	5.1	4.0	4.9	5.8	2.4	16.8
Kikombo	0.2	0.5	-	-	-	13.8	3.7	2.7	4.1	0.6	2.4	16.0
Nala	0	-	0.2	-	-	13.8	3.4	3.2	5.4	0.6	2.4	18.0
Mpunguzi	0.3	-	-	-	-	6.3	2.4	2.6	5.6	1.5	2.4	17.4
MPWAPWA												
Mpwapwa	4.3	0.8	2/	-	2.0	6.3	9.9	0.5	3.6	2.5	2.4	17.6
Kibakwe	8.8	0.4	2/	-	-	6.3	5.4	0.3	2.2	2.3	3.0	17.8
Mlali	13.4	1/	0.1	-	0	25.0	7.6	0.4	3.2	1.7	2.4	18.0
Zoissa	16.7	0.1	-	-	-	25.0	5.0	0.3	2.9	1.1	2.4	19.0
Kongwa	7.1	0.2	0	-	-	13.8	5.9	0.2	3.2	2.0	3.0	19.0
Rudi	1.9	0.4	2/	-	-	6.3	5.8	0.2	2.0	2.3	2.4	16.6
KONDOA												
Kondoa	1.5	-	-	-	0.9	6.3	4.8	0.8	4.5	3.7	0.6	17.6
Mondo	7.8	1.4	-	-	-	13.8	7.2	0.9	3.4	2.5	1.8	13.0
Farkwa	0	1.2	-	-	-	6.3	2.2	0.1	4.0	2.4	2.4	18.0
Kwamtoro	0.2	1.2	0.3	-	-	6.3	3.9	0.1	3.1	2.7	0.6	16.6
Pahi	7.8	0.3	0.1	0	-	25.0	7.9	0.2	4.5	1.6	1.8	15.0
Goima	6.0	0.1	0.1	2/	0	13.8	4.2	0.2	3.1	3.0	0.6	15.2
Bereko	8.2	0.4	-	-	-	13.8	6.8	0.5	4.3	1.7	2.4	2.4
Kolo	2.7	0.2	-	-	-	6.3	4.8	0.4	4.0	0.8	2.4	17.6
SINGIDA RURAL												
Ihanja	0.3	0.4	1.2	-	0.3	6.3	3.7	0.1	5.2	1.1	0.6	16.8
Ikungi	0.5	1.0	0.3	-	0.4	13.8	4.4	0.1	4.9	2.6	1.2	17.6
Manyoni	0.5	0.4	-	-	0.3	13.8	3.8	0.4	5.4	5.8	1.2	17.2
Mtinko	1.5	2.0	-	-	1.1	25.0	3.8	0.2	5.6	3.7	0.6	17.4
Mgori	0.5	0.3	0.2	0	0.1	6.3	3.3	0.2	6.0	2.5	0.6	14.4
Ilongero	2.7	0.4	0.4	-	0.4	25.0	8.2	0.4	5.4	1.4	1.8	13.4

1/ See Table VI-1 for description of factors, measurement units, range of factor values and rating scale.

2/ Less than 0.05.

NOTE: Data are rounded to the Zero nearest hundred unit. A 0 indicates that production was less than 50 units, while a Dash indicates no production.
Headings appear on Table VI-3.

TABLE VI-5

WEIGHTED RATINGS OF ADMINISTRATIVE DIVISIONS OF RURAL ACCESS ROADS

DISTRICT AND DIVISION	FACTOR NUMBER AND WEIGHT 1/											
	1	2	3	4	5	6	7	8	9	10	11	12
	WEIGHT											
	0.17	0.03	0.02	0.01	0.02	0.25	0.10	0.04	0.06	0.07	0.08	0.20
IRANGA												
Kirumi	0.5	0.7	0.4	-	0.5	6.3	4.8	0.2	4.3	2.4	3.0	17.2
Mlugati	10.5	0.8	-	-	0.3	25.0	6.5	0.7	3.2	3.0	1.2	17.2
Kyangiri	0.9	0.3	-	-	0.3	13.8	4.1	0.3	4.3	0.8	2.4	18.2
Kinampanda	0.5	0.8	0.3	-	0	6.3	4.5	0.7	4.5	0.1	2.4	18.2
Kisiriri	0.2	2.5	-	0.2	0.3	13.8	5.5	0.5	4.9	3.9	1.8	19.0
Miago	0.5	2.3	0.8	-	0.1	13.8	5.7	0.4	4.1	1.8	2.4	16.4
Shelui	0.7	2.0	-	0.2	2/	13.8	5.4	0.4	4.7	1.8	2.4	17.2
MANYONI												
Manyoni	-	0.9	-	-	0.2	13.8	2.3	0.4	6.0	7.0	1.8	19.8
Itigi	0.8	1.3	2.0	-	0.2	13.8	2.7	2/	5.6	3.2	3.0	18.4
Manyoni Vijijini	-	0.2	-	-	-	13.8	2.0	0.3	4.9	1.1	3.0	20.0
Kintinku	0	0.9	-	0	-	13.8	3.6	0.1	4.3	3.9	3.0	18.0
Nkonko	0.8	0.4	2.0	0	0.4	13.8	5.7	2/	3.8	4.7	1.8	17.2
SAME												
Same	0.3	0.4	-	-	1.4	13.8	2.3	0.1	2.0	6.8	3.0	15.4
Mwembe Mbaga	1.0	0.4	-	-	0.5	13.8	4.0	0.2	1.8	2.7	1.8	11.0
Gonja	1.9	-	0.6	-	0.6	13.8	2.7	0.9	2.2	1.6	3.0	10.4
Chome/Suji	0.7	1.4	1.2	-	0.4	13.8	3.6	0.2	2.5	3.9	3.0	14.4
Mamba Vunta	0	0.3	-	-	0	6.3	3.6	1.4	2.0	2.0	0.6	8.6
Ndungu	0.5	-	-	0.2	0.2	13.8	4.1	0.4	1.0	2.3	0.6	11.2
MWANGA												
Ugweno	2.2	-	-	-	0	25.0	3.8	1.4	2.0	3.0	3.0	8.8
Usangi	0.2	0.7	-	-	0.1	13.8	3.0	0.6	1.8	5.9	3.0	13.2
Mwanga	0.2	-	-	1.0	0.2	6.3	2.1	0.4	1.6	4.1	1.8	17.6
Lembeni	0.2	-	2/	0.9	0.4	6.3	2.2	1.2	0.5	2.3	0.6	10.0

1/ See Table VI-1 for description of factors, measurement units, range of factor values and rating scale.

2/ Less than 0.05.

NOTE: Data are rounded to the Zero nearest hundred unit. A 0 indicates that production was less than 50 units, while a Dash indicates no production.
Headings appear on Table VI-3.

TABLE VI-6

PRIORITY RANKING OF ADMINISTRATIVE DIVISIONS OF

RURAL ACCESS ROADS WITHIN EACH STUDY REGION

Region	District	Division	Weighted Ranking	Priority Ranking
Dodoma	Mpwapwa	Zoissa	58.5	1
	Mpwapwa	Mlali	55.7	2
	Dodoma Urban	Hombolo	48.4	3
	Kondoa	Mondo	45.5	5
	Kondoa	Pahi	45.4	13
	Kondoa	Bereko	42.1	6
	Mpwapwa	Mpwapwa	36.3	7
	Mpwapwa	Kongwa	36.3	4
	Mpwapwa	Kibakwe	36.2	10
	Kondoa	Goima	31.0	11
	Dodoma Urban	Nala	27.5	8
	Dodoma Urban	Mundemu	26.7	15
	Dodoma Urban	Kikombo	26.6	17
	Dodoma Rural	Chamwino	26.4	14
	Dodoma Rural	Itiso	26.1	9
	Dodoma Rural	Chipanga	24.8	12
	Dodoma Rural	Mvumi	23.4	16
	Kondoa	Kondoa	22.8	19
	Dodoma Rural	Makangwa	22.5	18
	Dodoma Rural	Mpunguzi	22.3	22
	Dodoma Rural	Mwitikira	21.6	20
	Mpwapwa	Rudi	20.9	23
	Dodoma Rural	Bahi	20.3	24
	Kondoa	Kolo	19.6	21
	Dondoa	Farkwa	18.3	25
	Kondoa	Kwamtoro	17.8	26
Singida	Iramba	Nduguti	52.6	2
	Singida Rural	Mtinko	37.6	3
	Singida Rural	Ilongero	37.5	1
	Iramba	Kisiriri	34.5	4
	Iramba	Ndago	32.3	9
	Iramba	Shelui	31.3	10
	Manyoni	Itigi	31.0	6
	Manyoni	Manyoni	30.3	5
	Manyoni	Nkonko	29.7	7
	Singida Rural	Mungaa	28.3	8
	Manyoni	Kintinku	26.4	11
	Singidi Rural	Ikungi	26.0	12
	Iramba	Kinyangiri	24.6	13
	Iramba	Kirumi	22.6	15
	Iramba	Kinampanda	20.0	16
	Manyoni	Manyoni Vinijini	19.9	14
	Singida Rural	Mgori	18.2	18
	Singida Rural	Thanja	16.9	17
Kilimanjaro	Mwanga	Ugweno	32.2	1
	Mwanga	Chome/Suji	29.0	3
	Mwanga	Chome/Suji	26.4	2
	Mwanga	Usangi	26.3	4
	Mwanga	Mwembe Mbaga	26.1	6
	Mwanga	Gonja	24.2	5
	Mwanga	Ndungo	17.0	7
	Mwanga	Mwanga	15.3	8
	Mwanga	Mamba Vunta	14.7	9
	Mwanga	Lembeni	12.2	10

TABLE VI-7

COMPARISON OF ADMINISTRATIVE DIVISION PRIORITY RANKINGS WITH

DISTRICT ROAD PRIORITY RANKINGS BY REGIONS

District and Division	Division District	Division Region	Priority Ranking ROADS Within 1 Division	Within 2 or More Divisions
DODOMA URBAN				
Hombolo	1	3	1, 2, 7	6
Nala	2	8	8, 9	3, 11, 12
Kikombo	3	16	4, 5	6, 10
Mpunguzi	4	22	-	3, 11, 19 (D.R.)
DODOMA RURAL				
Itiso	1	9	1, 11, 15, 16, 17	7, 20
Chipanga	2	10	6, 12	3, 13
Chamwino	3	14	18	20
Mandemu	4	15	9	3 (D.U.), 7, 10
Makangwa	5	17	-	21, 6 (MP)
Mvumi	6	18	14	2 (MP), 21
Mwitikira	7	20	4, 6	13, 19
Bahi	8	24	5	10, 12
MPWAPWA				
Zoissa	1	1	-	5
Mlali	2	2	7	1, 4
Kongwa	3	4	9, 14	1, 5, 4
Mpwapwa	4	6	8, 11, 12	1, 3, 6, 13, 16
Kibakwe	5	11	10	3, 13
Rudi	6	23	12, 15	3, 16
KONDOA				
Mondo	1	5	-	4, 5, 8
Bereko	2	8	1	11, 12
Goima	3	12	14	3
Pahi	4	13	10, 15	4, 7, 8, 11, 12
Kondoa	5	19	9	4, 7
Kolo	6	21	-	-
Farkwa	7	25	-	2
Kwamtoro	8	26	6	3, 2

Note: D.R. = Dodoma Rural; D.U. = Dodoma Urban; MP = Mpwapwa; S.R. = Singida Rural; M = Mwanga.

Source: Region rankings for the administrative divisions are from Table VI-6, while district rankings for these divisions are based upon the regional rankings. Priority rankings of the individual roads within each division or between two or more divisions are those provided by the District Engineers of each district.

TABLE VI-7

COMPARISON OF ADMINISTRATIVE DIVISION PRIORITY RANKINGS WITH

DISTRICT ROAD PRIORITY RANKINGS BY REGIONS

District and Division	Division District	Division Region	Priority Ranking ROADS Within 1 Division	Priority Ranking ROADS Within 2 or More Divisions
SINGIDA RURAL				
Ilongero	1	1	2, 13	1
Mtinko	2	3	3	1, 11, 12
Mungaa	3	8	6, 8	5, 7
Ikungi	4	12	9	7, 10
Ihanja	5	17	-	10
Mgori	6	18	-	4
IRAMBA				
Nduguti	1	2	5, 10	2, 4
Kisiriri	2	4	1, 11	6
Ndago	3	9	-	3, 7, 12 (S.R.)
Shelui	4	10	-	7
Kinyangiri	5	13	9	2, 8
Kirumi	6	15	-	4, 2
Kinampanda	7	16	-	3, 6, 8
MANYONI				
Manyoni	1	5	-	1, 2, 9
Itigi	2	6	3, 5, 15	2, 9
Nkonko	3	7	8, 10, 12, 16	1, 11
Kintinku	4	11	6, 7, 13, 14	-
Manyoni Vijijini	5	14	4	1, 11
SAME				
Same	1	2	7	1, 7 (M), 8, 14 (M), 16 (M)
Chome/Suji	2	3	5	6, 8, 11
Gonja	3	5	4	1, 9, 10
Mwembe Mbaga	4	6	3	1, 6, 11
Ndungu	5	7	-	10
Mamba Vunta	6	9	9	2, 1
MWANGA				
Ugweno	1	1	-	1, 2, 3, 4, 5, 12
Usangi	2	4	-	2, 4, 11, 12, 15
Mwanga	3	8	-	1, 4, 5, 6
Lembeni	4	10	10, 13	4, 7, 8, 9, 11, 14

Note: D.R. = Dodoma Rural; D.U. = Dodoma Urban; MP = Mpwapwa; S.R. = Singida Rural; M = Mwanga.

Source: Region rankings for the administrative divisions are from Table VI-6, while district rankings for these divisions are based upon the regional rankings. Priority rankings of the individual roads within each division or between two or more divisions are those provided by the District Engineers of each district.

welding has thus been largely achieved between priorities based upon socioeconomic factors and those reflecting need as perceived by the District Engineers. In scheduling the road rehabilitation and maintenance program, the consultant's engineers are utilizing the District Engineers' priorities, coupled with considerations of efficiency and management in assigning the individual road projects within or between the divisions.

PRIORITY RANKINGS BY DISTRICTS WITHIN EACH OF THE THREE STUDY REGIONS BASED UPON TOTAL AND AVERAGE SOCIOECONOMIC/COST SCORES

Region	District	Total Socio-economic/Cost Score	Rank	Average Socio-economic/Cost Score	Rank
Dodoma	Dodoma Rural	3,479	1	433	3
	Dodoma Urban	1,863	4	466	2
	Mpwapwa	3,322	3	554	1
	Kondoa	3,448	2	431	4
Singida	Singida Rural	3,008	2	501	2
	Iramba	3,403	1	567	1
	Manyoni	2,459	3	492	3
Kilimanjaro	Same	2,245	1	374	2
	Mwanga	1,496	2	374	1

Source: Table VI-6.

VII

VII TECHNICAL ANALYSIS

A. General

The road network presently inventoried in each region and district, exclusive of Trunk Roads, is summarized in Table VII-1 and listed in Table VII-2. Trunk Roads were excluded since a Trunk Road Maintenance Program presently exists and because the objective of this project is to provide improved access roads for rural areas. Local Main Roads have been included even though they are part of the secondary road system and can hardly be classed as access roads; however, the lengths involved are relatively short.

The Regional Engineers and District Engineers provided a list of roads for each district during the first field visit. Representative roads were selected, usually by the District Engineer and his staff, for inspection. District priorities were requested and these were provided during the second and third field visits.

Forms for detailed road inventories were prepared and left with the District Engineers during the second and third field trips to complete and forward. Since only a few District Engineers returned the completed forms, the road inventory was compiled by personal inspection, discussion with various Government officials, and existing and updated inventory data. Much of the data was obtained from the District Engineers' memories and inaccuracies are inevitable.

Preliminary priorities were established by the economists before the second and third field visits, and additional roads were selected for inspection based on economic and social factors, which procedure is described in Section VI.

TABLE VII-1

SUMMARY OF ALL ROADS AS PROVIDED
BY THE GOVERNMENT REGIONAL AND DISTRICT ENGINEERS

PRESENT CLASSIFICATION

Region	District	Local Main	District	Feeder	Total
Dodoma	Mpwapwa	112	301	1,025	1,438
	Dodoma	0	499	792	1,291
	Kondoa	155	247	698	1,100
	Subtotals	(267)	(1,047)	(2,515)	(3,829)
Singida	Singida	0	208	721	929
	Iramba	24	250	454	728
	Manyoni	0	82	514	596
	Subtotals	(24)	(540)	(1,689)	(2,253)
Kilimanjaro	Same	163	198	117	478
	Mwanga	93	340	102	535
	Subtotals	(256)	(538)	(219)	(1,013)
	TOTALS	547	2,125	4,423	7,095

TABLE VII-2

LIST OF ALL ROADS AS PROVIDED BY
THE GOVERNMENT REGIONAL AND DISTRICT ENGINEERS

A. Dodoma Region

Present Classifications/Description	Length (km)
1. Mpwapwa District	
a. Local Main Roads	
Nghambi-Mpwapwa-Mlali	81
Mpwapwa-Gulwe	15
Matomondo-Godegode	16
Total Local Main Roads	112 km
b. District Roads	
Trunk Road - Zoissa	63
Mlali - Pandambili	24
Trunk Road - Kongwa	3
Kongwa - Suguta	40
Chunyu - Msagali	10
Gulwe - Rudi	74
Kibakwe - Mwana Wota	23
Gulwe - Fufu	64
Total District Roads	301 km
c. Feeder Roads	
Trunk Road - Vilundilo	10
Godegode - Mbuga	75
Kibakwe/Rudi Road - Massa - Idodoma	78
Rudi - Chipogoro	37
Igoji - Mtabma	30
Rudi - Kisima	33
Chogola - Winza	15
Massa - Galigali	15
Chamtumile - Kidege - Lufu	27
Msagali - Mpondi - Ngalomilo	18
Mima - Nzelu	11
Zoissa - Pingalame - Izava	21
Tubugwe - Matomondo Shuleni	10
Pandambili/Zoissa Junction - Ngomai	6
Kongwa Mission - Kongwa Maji	11
Chinyike - Nyabu	15
Lumuma - Kidete	8
Hogoro - Ngomai	18

c. Feeder Roads (continued)

North Hogoro - Matongolo - Mlanje	10
Behero - Kimagai - Godegode	20
Kinusi - Ulelingombe	21
Mlali - Pembamoto	5
Igoji Mwalanje - Borehole	5
Mbori - Tambi Mlembule (Mlali Road)	30
Mima - Mkanana - Wota	43
Pandambili - Njoge - Zoissa	74
Mlali - Rubeho	11
Junction Kibakwe - Mpwanila - Luhundwa - Kindenge - Pwaga	15
Junction Sagara - Mlali - Iduo Kisimani	3
Ngalamiro - Wind Pump	8
Lupeta Bumila - Tubuque Mangweta	21
Chikuyu - Mangalisa	15
Kongwa - Manungu - Sejeli - Mukulani	20
Chilendu - Chishima	32
Mima Road - Berege - Silo	8
Ngalamiro - Handali Boda	13
Pandambili - Lenjulu - Kisimani	10
Moleti - Kisimani	3
Ngomai - Kisimani	6
Zoissa - Pingalame - Kisimani	5
Mpwapwa Road Junction - Chamnawa	5
Igoje - Mlenje - Kisimani	5
Ibumila - Fugugwe - Manghweta	21
Hogoro - Hogoro - Kaskazini	11
Igoji - Mngumali	6
Mlali - Kisitu	13
Mlali - Chugumano - Ihande	13
Mlali - Bondeni Shule	6
Massa - Makose	6
Chileta Road - Rudi Barabarani	24
Pandambili - Chileto	40
Rudi - Singonali	13
Rudi - Mkoata	19
Kongwa Mantnya	19
Kongwa - Chibaishe	8
Total Feeder Roads	1,025 km

2. Dodoma District

a. Local Main Roads — None

b. District Roads

Dodoma - Mvumi - Nkulabi	41
Mvumi - Handali	18
Trunk Road - Kikombo - Handali	27
Handali - Kitemo	29
Mkonze - Chidilo - Nondwa	52

b. District Roads (continued)

Chidilo - Chipanga - Chali - Ikasi	34
Chali - Chikopero - Chipanga	29
Mpunguzi - Mwitikira - Mpwayungu	40
Trunk Road - Hombolo - Meia Meai	52
Trunk Road - Msanga - Chilonwa - Dabalo - Itiso	98
Chenene - Itiso - Izava	79
Total Districts Roads	499 km

c. Feeder Roads

Ntyuka - Chologo	27
Trunk Road - Ihumwa - Kikombo	22
Nghahelezi - Igandu	10
Nondwa - Chifutuka	20
Chifutuka - Huzi	15
Huzi - Chinungulu	29
Mpwayungu - Huzi - Ilangali	60
Nghome - Mwitikira	30
Mlowa Barbarani - Idifu	20
Makatapora - Chihanga - Gawaye	28
Hombolo Dam - Mkoyo - Kawawa	16
Hombolo - Zepisa	10
Ipala - Chahwa - Vikonje	14
Nala - Zuzu	10
Zuzu - Mbabala	20
Nala - Mbalawala	10
Mbalawala - Ilindi	24
Mbalawala - Mundemu - Mzakwe	20
Mundemu - Lamaiti	30
Lamaiti - Mkakatika - Bahi	40
Chigongwe - Kigwe - Ngulugano - Chipanga	36
Kigwe - Mpinga - Ngulugano	17
Trunk Road - Msange	13
Chilonwa - Chinangali - Majeieko	8
Dabalo - Manyembe	20
Itiso - Zajilwa	15
Itiso - Haneti	33
Haneti - Humekwa	19
Ngaloni - Mlimwa	8
Mgunga - Ikowa - Chalinze	12
Bahi Sokoni - Makanda	15
Ngaherize - Igandu	10
Kikombo - Mnase - Chalinze	33
Ibihwa - Bankolo	35
Chifukulo - Nchinila - Ibugule	28
Fufu - Chiboli - Suli	35
Total Feeder Roads	792 km

3. Kondoa District

a. Local Main Roads

Meia Meia - Babayu - Kwamtoro	68
Bicha - Dalai - Tandala - Kolo	84
Bicha - Kondoa	3
Total Local Main Roads	155 km

b. District Roads

Araa - Chandama - Mrijo Chino	48
Jangalo - Tandala	21
Mnenya - Kisese - Kikore	50
Kondoa - Kwamtoro	56
Kwamtoro - Kiryamsindo	48
Kwandinu - Thawi	24
Total District Roads	247 km

c. Feeder Roads

Chemba - Goima	16
Chandama - Jangalo	12
Pahi - Bumbuta - Chubi	37
Chubi - Arusha Region Boundary	16
Bumbuta - Chungai	12
Kisaki - Kisese	16
Gubali - Mwisanga	27
Busi - Chuvaku	12
Kandaga - Bukulu	16
Kisese - Bereko	16
Chasinge - Kingale - King'ang	18
Sanza - Mpendo	43
Chemba - Gwandi - Tumbakos	63
Dovo - Lahoda	15
Busi - Kwadelo - Churuku	38
Tumbakose - Hawelo	10
Dachenje - Kikore	13
Dalai - Piho - Chemba	17
Chemba - Ombile	14
Itundwi - Bumbuza	14
Baura - Loo - Kwanti	22
Lake Serya - Thawi	63
Kisese - Dachenje	20
Kikilo - Bereko	10
Chandama - Soyo - Mkekeya	38
Chemba - Gwandi - Dousee	64
Songoro Hamai - Mtakuja	16
Jangalo - Mtumbaji	40
Total Feeder Roads	698 km

B. Singida Region

Present Classifications/Description	Length (km)
1. Singida District	
a. Local Main Roads	None
b. District Roads	
Singida - Ilongero - Mtinko	40
Ilongero-Merya - Mdilu	21
Singida - Sepuka	22
Mangonyi - Ikungi	24
Ikungi - Dungunyi	10
Dungunyi - Mungaa	13
Mungaa - Makiungu - Kititimo	14
Kititimo - Mgori	11
Ntuntu - Mungaa	19
Ihanja - Matongo	22
Puma - Ihanja	12
Total District Roads	208 km
c. Feeder Roads	
Mtinko - Mudida	11
Sepuka - Mahenge	35
Singida - Ihanja	29
Londoni - Mangonyi	29
Mungaa - Misughaa - Kinyamsindo	39
Misughaa - Ntuntu	11
Misughaa - Mgori - Ngima Pochama	48
Ihanja - Munitiri - Yumbu - Mwaru - Sepuka	153
Ikungi - Matongo	6
Ihanja - Minyughe	19
Sambalu - Londoni	5
Ilongero - Ngomai	21
Merya - Msanga - Mangida - Sagaru	21
Mery - Mughama - Nangasi - Ngimu	18
Ngamu - Mudilu - Ghata	11
Mtinko - Ughandi - Iguguno	23
Mtinko - Makuro - Diagwa	35
Mgori - Misughaa - Musule	29
Mgori - Mughanga - Langakungebe	35
Mantaninga - Masiriva - Dugaghange	37
Makuro - Nkenke	16
Ntinko - Mpambaa - Singa	16
Singida - Kinyeto - Merya	40
Ntuntu - Mwani - Mangonyi	13
Igauri - Irisya - Nkwao	21
Total Feeder Roads	721 km

2. Iramba District

a. Local Main Road

Misigiri - New Kiomboi	24 km

b. District Roads

Iguguno - Kinyangiri - Mkalama	80
Sepuka - Songambele - Kisaga	54
New Kiomboi - Kinakumi	8
Kitusha - Kinakumi - Tulya	68
Ulemo - Msingi - Gumanga	40
Total District Roads	250 km

c. Feeder Roads

Ndguti - Iambi - Nkungi	35
Ndguti - Nkalankala - Munguli	58
Nkalankala - Mwanga - Kidarafa	28
Songambele - Urughu - Kibigiri	56
Tulya - Doromoni	6
Msingi - Iguguno	22
Ndago - Mtekende	14
Mkulu - Mtoa	19
Tulya - Kidaru	21
Gumanga - Mkika	15
Kidaru - Mkalama	22
Chem Chem - Mkalama	11
Kinyangiri - Msingi	11
Kiomboi - Kisiriri	11
Mwando - Matango	45
Ruruma - Kiomboi	9
Kisuruinga - Nkinto	24
Kisiriri - Kidaru	14
Kisiriri - Eimanga	6
Nkinto - Inshalo	16
Kiomboi Hospital - Kisimba	11
Total Feeder Roads	454 km

3. Manyoni District

a. Local Main Roads — None

b. District Roads

Manyoni - Aghondi - Itigi	40
Manyoni - Heka	42
Total District Roads	82 km

c. Feeder Roads

Aghondi - Muhanga - Ipande - Mbugani	49
Itigi - Chaya	43
Itigi - Damwalu	10
Manyoni - Njiri	16
Heka - Sasilo	24
Heka - Nkonko	25
Nkonko - Ntumbi	19
Nkonko - Majiri	79
Majiri - Chikuyu	40
Majiri - Kinangali - Makasuku	12
Makasuku - Itetema	11
Makasuku - Kilamatinde - Solyo	27
Trunk Road - Kintinku - Kitaloio	8
Kintinku - Makanda	32
Chikuyu - Makutupora	11
Chikuyu - Mbwasa	8
Solyo - Saranda - Hika - Londoni	72
Iseke - Simbanguru	24
Chikola - Winamila	4
Total Feeder Roads	514 km

C. Kilimanjaro Region

1. Same District

Present Classification/Description	Length (km)
a. Local Main Roads	
Makanya - Mwembe	38
Mkanyeni - Vudee	8
Same - Mwembe - Manka - Msindo - Bomba-Mamba	104
Ndungu - Mamba	13
Total Local Main Roads	163 km
b. District Roads	
Makanya/Mwembe Road - Chome	19
Makanya - Kombo - Meferejini	71
Meferejini - Same	26
Kisiwani - Msindo	16
Mpirani - Bomba	12
Mpirani - Kadando	9
Maore - Makongoanzeghe	21
Hedaru - Vunta	24
Total District Roads	198 km
c. Feeder Roads	
Mamba - Saseni	9
Msanga - Chome	16
Hedaru - Mhiza	25
Saseni - Vunta	20
Suji - Gonjanza	6
Saseni Suji	8
Msindo - Chabru - Vudee	8
Same - Kizungo - Vumari	25
Total Feeder Roads	117 km

2. Mwanga District

a. Local Main Roads	
*Kisangara - Nyumba Ya Mungu Dam	17
Mwanga - Kikweni	11
Kikweni - Usangi	14
Kikweni - Kifula - Mangio - Uchama	18
Campi Ya Simba - Uchama	7
Muvraini - Usangi	6

* Most of this road is in Same District

a. Local Main Roads (continued)

Mwanga - Kagongo	20
Total Local Main Roads	93 km

b. District Roads

Kibisini - Mangio	10
Butu - Kifula	7
Kwakoa - Toloha	15
Kisangara - Upper Kisangara	15
Kisangara - Chanjali - Chonvu	30
* Lembeni - Kirya	20
Lembeni - Kilomeni	15
*Mgagau - Ndea	15
Kifula - Koreni - Msangeni	6
Ndanda - Msangeni - Kwambalaghile Butu	20
Kikweni - Nrume - Simbomu (Kwa Wachaga)	15
Simbomu (Kwa Wachaga) - Lambo	10
Shighatini - Ndambwe	10
Mfinga - Chela	6
Shighatini - Kighare - Kwamsembea	10
Kwamlaki - Kileo Hospital Kibisini Mnea	20
Kifaru - Msufini Mbaleni	10
Kifaru Tingatinga - Handeni Lang'ata	20
Langa'ta - Nyambinda	10
Kilaweni - Ngujini	5
Vonda - Mfere - Simbomu	8
Mwaniko - Mriti	5
Kirongwe - Mbale	10
Kiriche - Mwero	10
Lomwe - Makandeni Ndorwe	8
Mwaniko - Kibisini	10
Barbara sa Mjikao Maguu - Wilaya	20
Total District Roads	340 km

*Most of these roads are in Same District

c. Feeder Roads

Kifaru - Campi Ya Simba - Butu - Kwakoa-Mgagau	80
Kifaru/Campi Ya Simba Road - Kibisini	7
Chonvu - Usangi	15
Total Feeder Roads	102 km

B. Existing Road Facilities

1. Present Roadway Conditions

During the period January 16 to March 24, 1980, the Study Team physically inspected and inventoried 591 km of feeder roads and 1,654 km of Local Main, Regional and District roads, including shops, equipment and personnel, in the three regions comprising the study area.

In general, on the Local Main, District or Regional roads, it was found that relatively little maintenance effort had been expended during the last few years. Most roads had deteriorated to the point where the travelway was depressed below the surrounding terrain, thus forming a water channel; some culverts were broken or filled with silt or too low to accommodate the drainage; roadside ditches and miter drains were deteriorated or nonexistent; and drifts either collapsed or undermined on the downstream side to the point of being hazardous. Gravel or other granular surfacing materials had, in many cases, been dissipated through neglect of maintenance or natural causes. In some of the mountainous areas, this condition had progressed to the point where the underlying bedrock was exposed, thus leaving an exceedingly rough travelway. In numerous other instances, due to the absence or neglect of drainage facilities, both transverse and longitudinal scour had occurred to the travelway, thus making the road impassable to the normal single axle drive vehicle.

Vegetation control on most roads showed evidence of some degree of attention in that grass and brush had not overgrown the travelway to any appreciable extent. However, clearing the shoulders and ditch lines appeared to be minimal.

The major common deficiency observed on the bridges was evidence of scour. In the majority of cases, the footings of the abutment had been undermined to the extent that the footings were exposed, and serious bank erosion was occurring. Bank protection, such as gabions or rubble masonry scour control, has been applied infrequently. This condition cannot be allowed to continue without risking severe damage or collapse of many structures and cut through the roadway itself, thus isolating the bridge completely and resulting in a complete road closure. Several instances

were observed where the bridge was not properly aligned with the stream or waterway, resulting in the inevitable scour damage to the abutment.

In general, Feeder Roads exhibit the same deficiencies previously described. In many instances these roads, as well as some district roads, even though a portion of the roads can be identified, soon deteriorate into a track or path with no defined roadway, drainage or vegetation control. Numerous extensive areas of unsuitable "black cotton" soil material require a vehicle to detour through the bush to avoid becoming stuck, even in the dry season.

Many of these roads are only tracks (some only trails) which have never been improved beyond an occasional drift or culvert. Most of these roads become impassable for short periods during heavy rains.

Trafficability is not a more serious problem during the rains because the soils are generally granular. Black clays, as "black cotton" soils, quickly become impassable during the rains, but these areas are mostly restricted in size, such as in small topographic depressions.

Many roads are impassable because bridges are needed or have been washed out. Since many of the streams and rivers have granular beds and flow only for relatively short periods after rains, traffic is usually only temporarily delayed. Available details on bridges are provided in Tables A-VII-2 and A-VII-3 in the Appendix.

Table A-VII-2 of the Appendix presents, in tabular form, the classification and condition of the roads inventoried by the Study Team.

a. Shops and Equipment

The Regional and District Shops are, almost without exception, poorly organized and lack the basic maintenance and repair facilities and adequate elementary spare parts stock to provide the essential services expected from these facilities. In addition, these shops are required to provide services and repairs to all Government equipment and vehicles in the Region or District, in addition to those units necessary for road maintenance. Thus a facility that is already unsatisfactory is also overloaded.

The equipment assigned for the maintenance of roads has deteriorated from the conditions noted in the 1971-72 survey made by Lyon

Associates. Very little new equipment for maintenance of roads or for the shops was observed. The ratio of operable equipment to deadlined units has increased from the estimated 45% in 1972 to well over 55% in 1980. Deadlined and obsolete units of equipment outnumber the usable fleet at the present time.

In summary, the existing shop facilities and road maintenance equipment are totally inadequate to provide the services required to maintain the roads to an acceptable standard.

b. Personnel

The availability of qualified engineers, technicians, operators and mechanics indicate some slight improvement since the in-depth study of 1972 by the Lyon Team. The Government has initiated an overseas recruitment program for Indian engineers, but has been unable to obtain the number of personnel desired. The University of Dar es Salaam, during the current academic year, expects to graduate about 60 engineers and about the same each year for the next few years, according to current enrollment. Some of these graduates are expected to join the private sector while the majority will be apportioned to the various Governmental Departments (Water, Roads, etc.). The Training School at Morogoro is functioning for technicians, operators, and mechanical training, and should provide some limited relief in this sector.

There is still, as in the past, a serious shortage of qualified personnel down to, and including, the foreman level. In one case, the Regional Engineer was required to perform the duties of District Engineer in one of his three Regional Districts, and in another case the District Engineer had no Road Inspectors or reliable foreman and must also cover an additional District because of the lack of a senior engineer.

From the foregoing, it is evident that the staffing at the district level is still seriously undermanned for road maintenance activities, not only in the professional category, but also in the subprofessional and operational categories.

It is noted that, in 1978, there were 73 vacant positions in the Ministry of Works Roads Division. The Government had been attempting to fill 62 of these positions through recruitment of Indian engineers; however, by the end of 1978, only 5 of these engineers had arrived. The bulk of the unfilled positions are in the Maintenance Section, whereas the people being recruited are usually engineers who will work mainly in the design, construction, and materials sections, where the need for fully qualified personnel is the greatest.

Some relief to this situation may be forthcoming in the future with continued overseas recruitment, university graduates, and technical training school personnel. This relief is several years away, and even when it becomes available, these people will lack the actual work experience necessary to qualify them for independent supervisory duties. Additional on-the-job training will be required to obtain the management and operational experience necessary to permit them to function in an efficient manner.

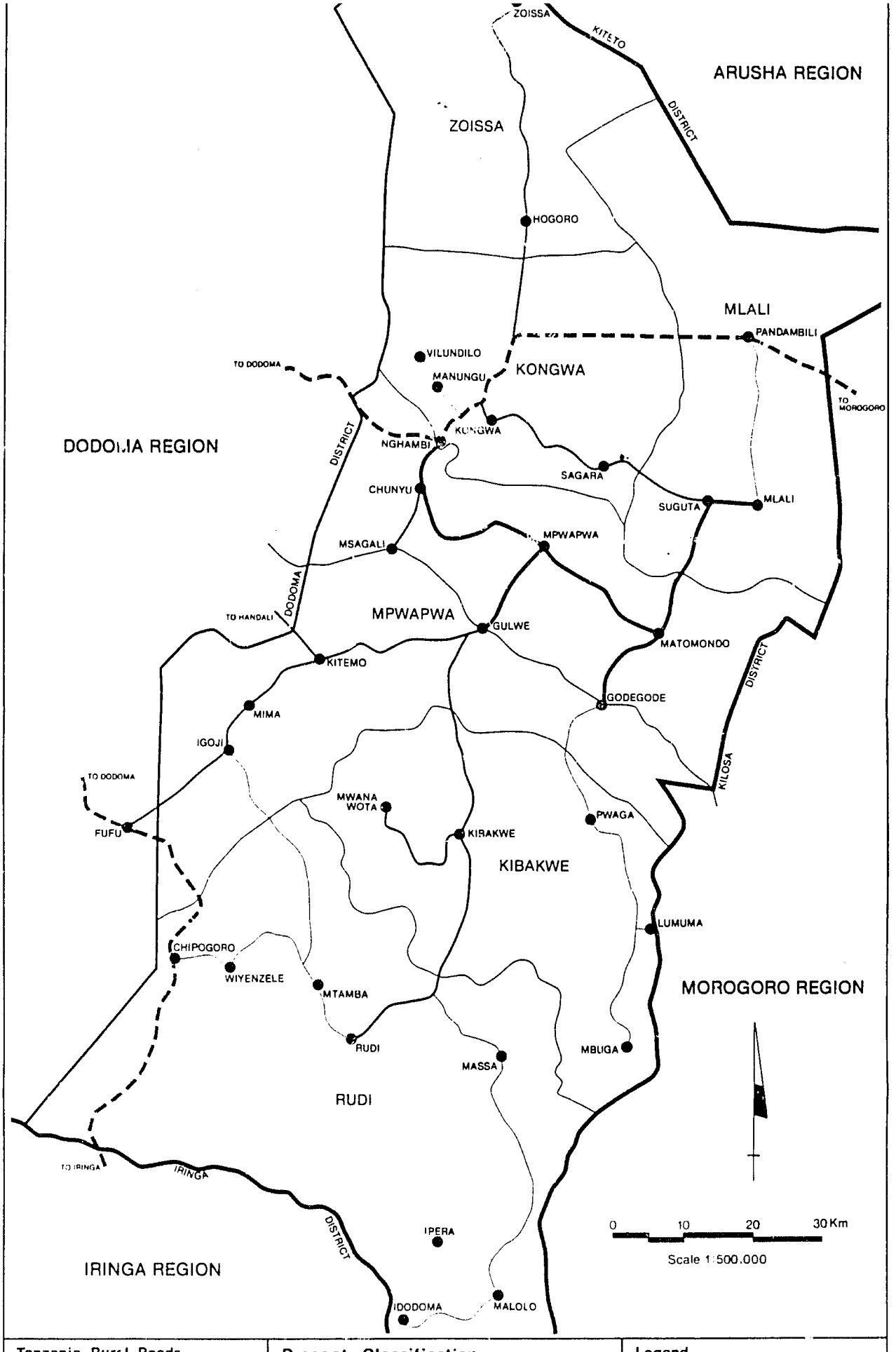
2. Road Inventories

Details on the roads in the project districts are discussed in this section. All of the roads presently carried on the district or regional inventories are summarized in Table VII-1, and listed in Table VII-2. The road classifications and location were provided by the local Government Engineers. All of these roads that could be located by the local Government Engineers are shown on Plates VII-1 through VII-8.

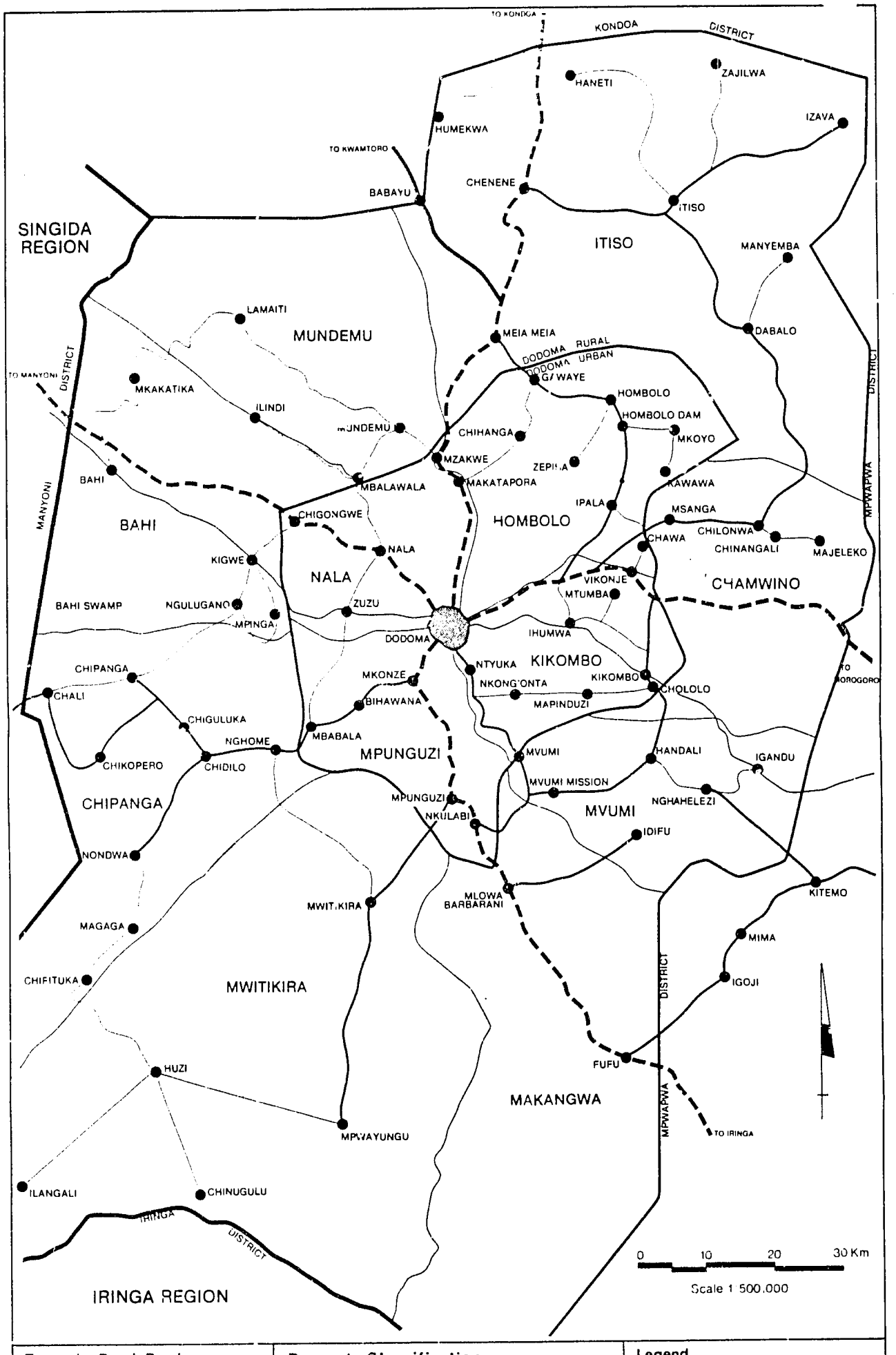
Some of the roads or road segments carried on these inventories actually do not exist, even as tracks. Some are planned but at the present time cannot be traversed except on foot. It should be noted that Plate VII is titled Mwanga District, although it shows the major parts of three roads in the northern part of Same District. This is because these three roads are listed in the Mwanga District road inventory. These roads are: Kisangara-Nyumba Ya Mungu Dam, Lembeni-Kirya, Mgagau-Ndea.

Details on the roads have been included when made available by the District Engineers. The inventories should be updated and maintained. Information of bridges, culverts, material sources, road conditions, etc. is required for any intelligent planning for maintenance as well as rehabilitation.

The Study Team examined 2,239 kilometers of Local Main, Regional, District and Feeder Roads on three field trips between January 16 and March 24, 1980. This represents about 33% of the roads carried on the inventories. These roads are summarized in Table VII-3, and an inventory is provided in Table A-VII-2. The locations of these roads are included on Plates VII-1 through VII-8. The lists are arranged by administrative regions, districts, and present road classifications. The order of listing is arbitrary and does not represent any prioritization. The lengths shown are those measured by the various odometers, and may not be the same as those shown for the same road segments in other tables of this report. The lengths of road segments in other tables generally use the lengths provided by the local Government Engineers.



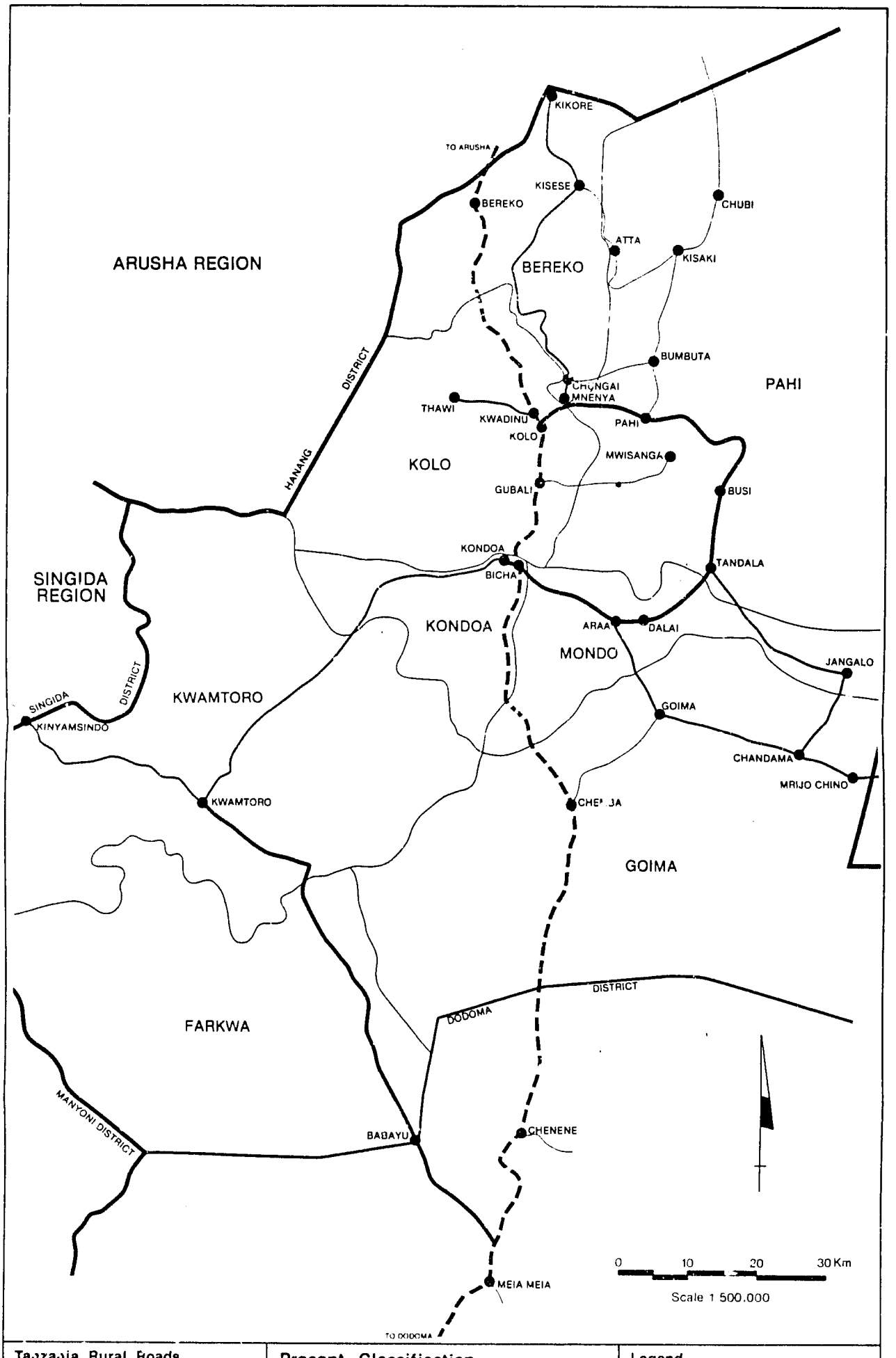
Tanzania Rural Roads Feasibility Study LYON associates, inc. in association with James R Snitzler Associates, Inc.	Present Classification of Selected Roads Dodoma Region / Mpwapwa District Plate VII-1	Legend Railroad — Feeder Road Division — District Road District — Local Main Road Region — Trunk Road



Tanzania Rural Roads Feasibility Study
LYON associates, inc.
in association with
James R. Snitzler Associates, Inc

Present Classification of Selected Roads Dodoma Region / Dodoma District
Plate VII-2

Legend
- Railroad
- Division
- District
- Region
- Feeder Road
- District Road
- Local Main Road
- Trunk Road



Tanzania Rural Roads Feasibility Study
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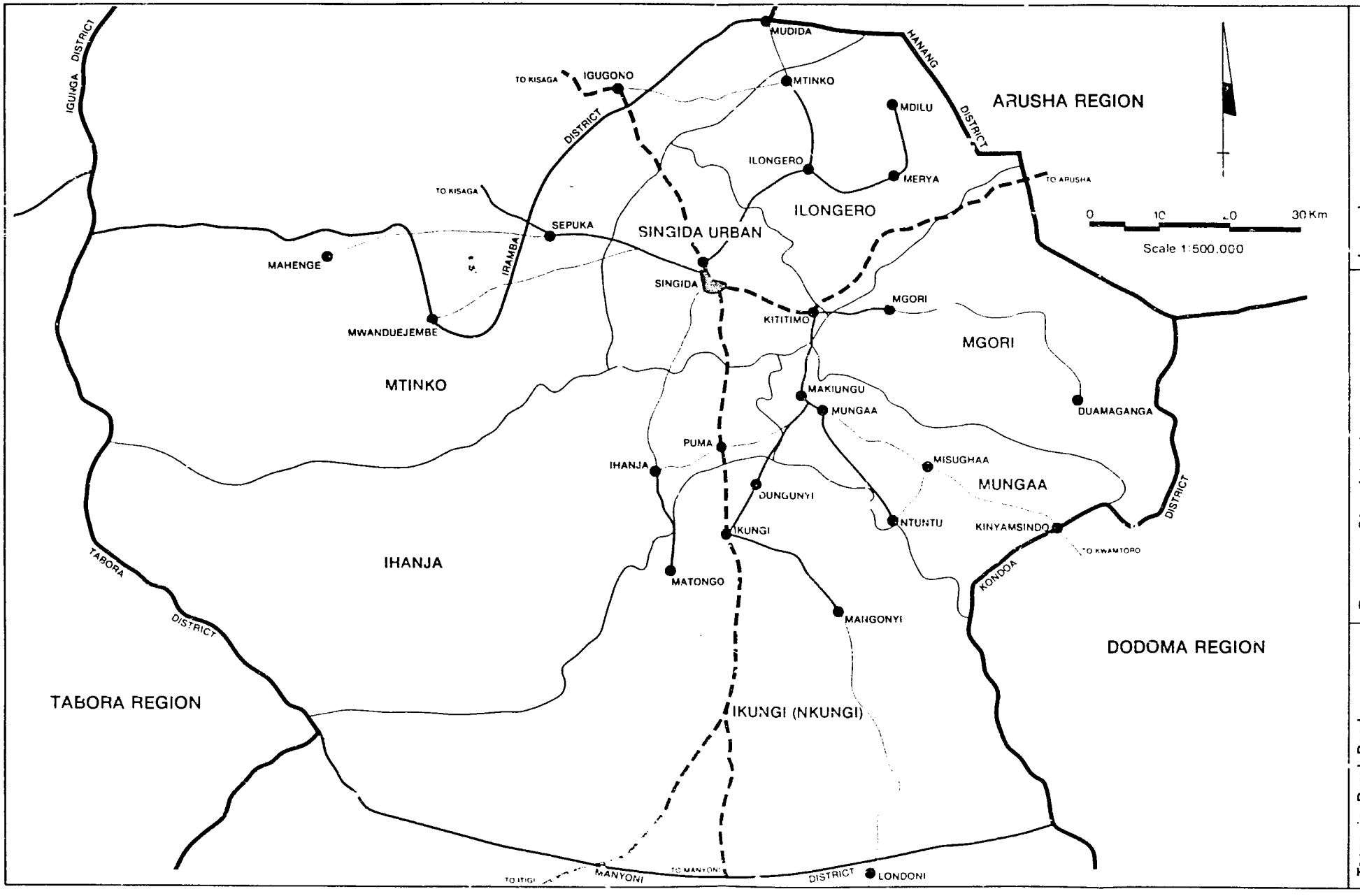
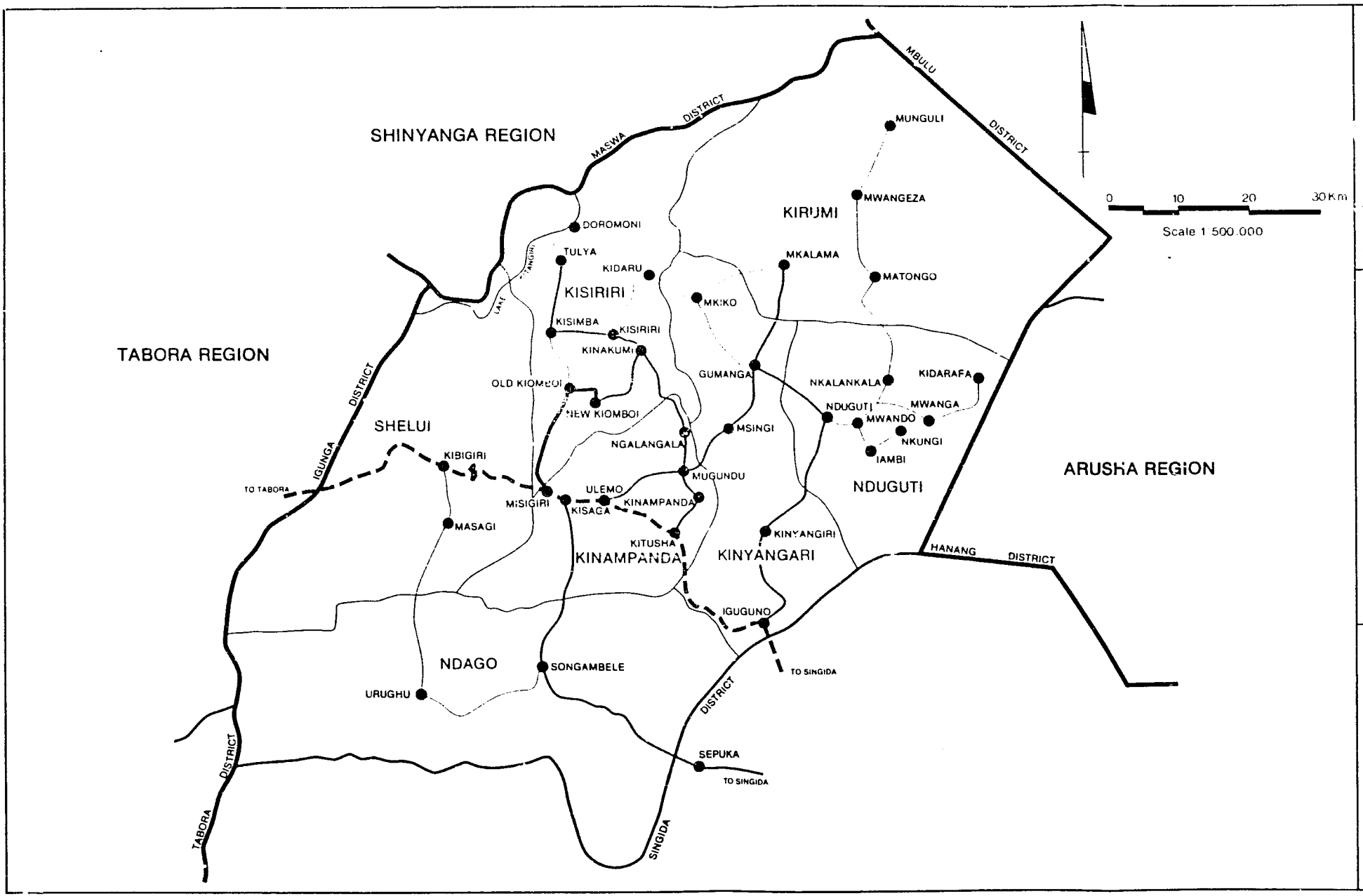
Present Classification of Selected Roads Dodoma Region / Kondoa District
Plate VII-3

Legend
- Railroad
- Division
- District
- Region
- Feeder Road
- District Road
- Local Main Road
- Trunk Road



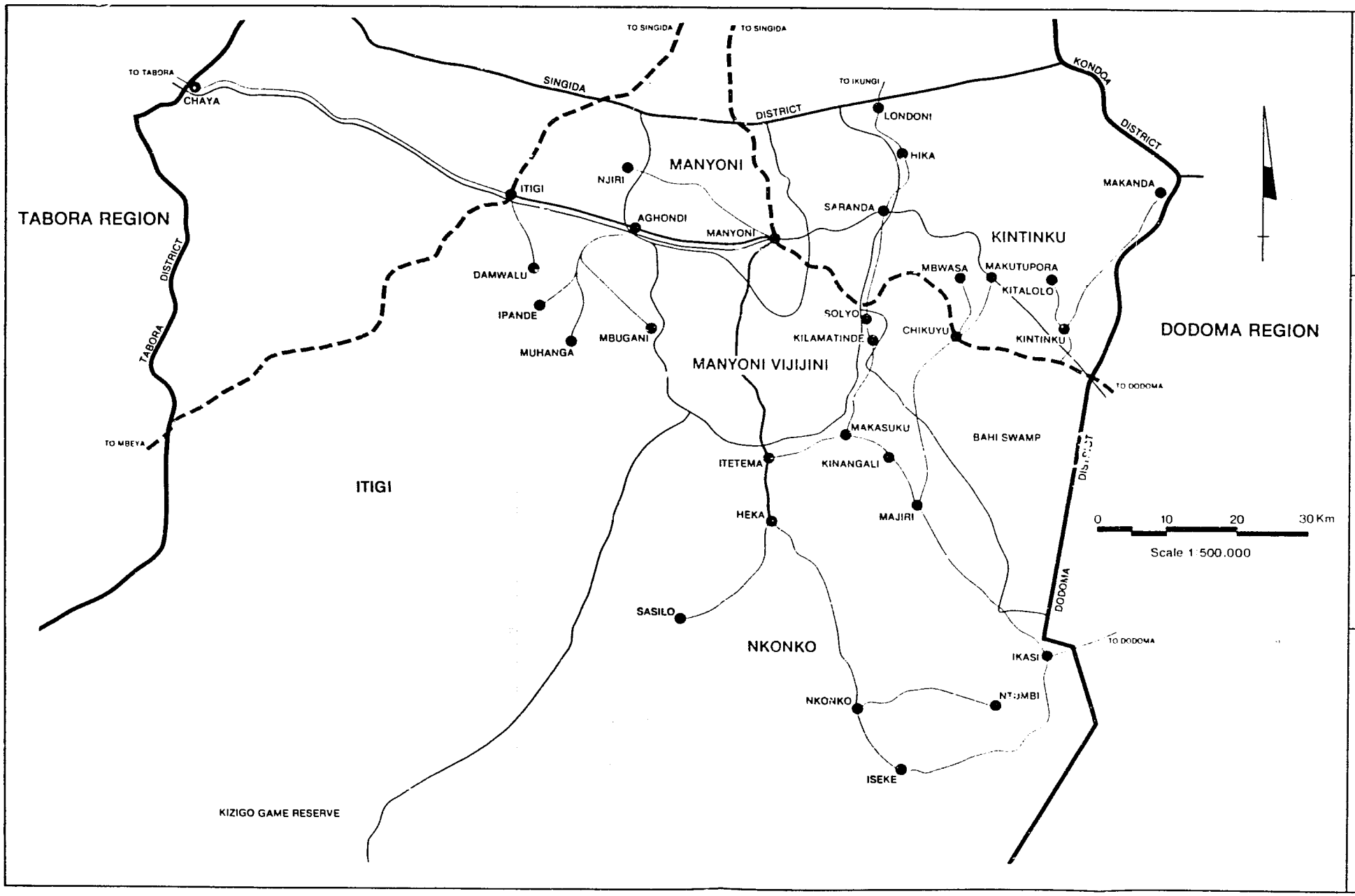
Present Classification of Selected Roads
Singida Region/Singida District
Plate VII-4

Tanzania Rural Roads Feasibility Study
LYON associates, inc.
in association with
James R. Snitzler Associates, Inc.



Present Classification of Selected Roads
Singida Region/Iramba District
Plate VII-5

Tanzania Rural Roads Feasibility Study
LYON associates, inc.
in association with
James R. Snitzler Associates, Inc.

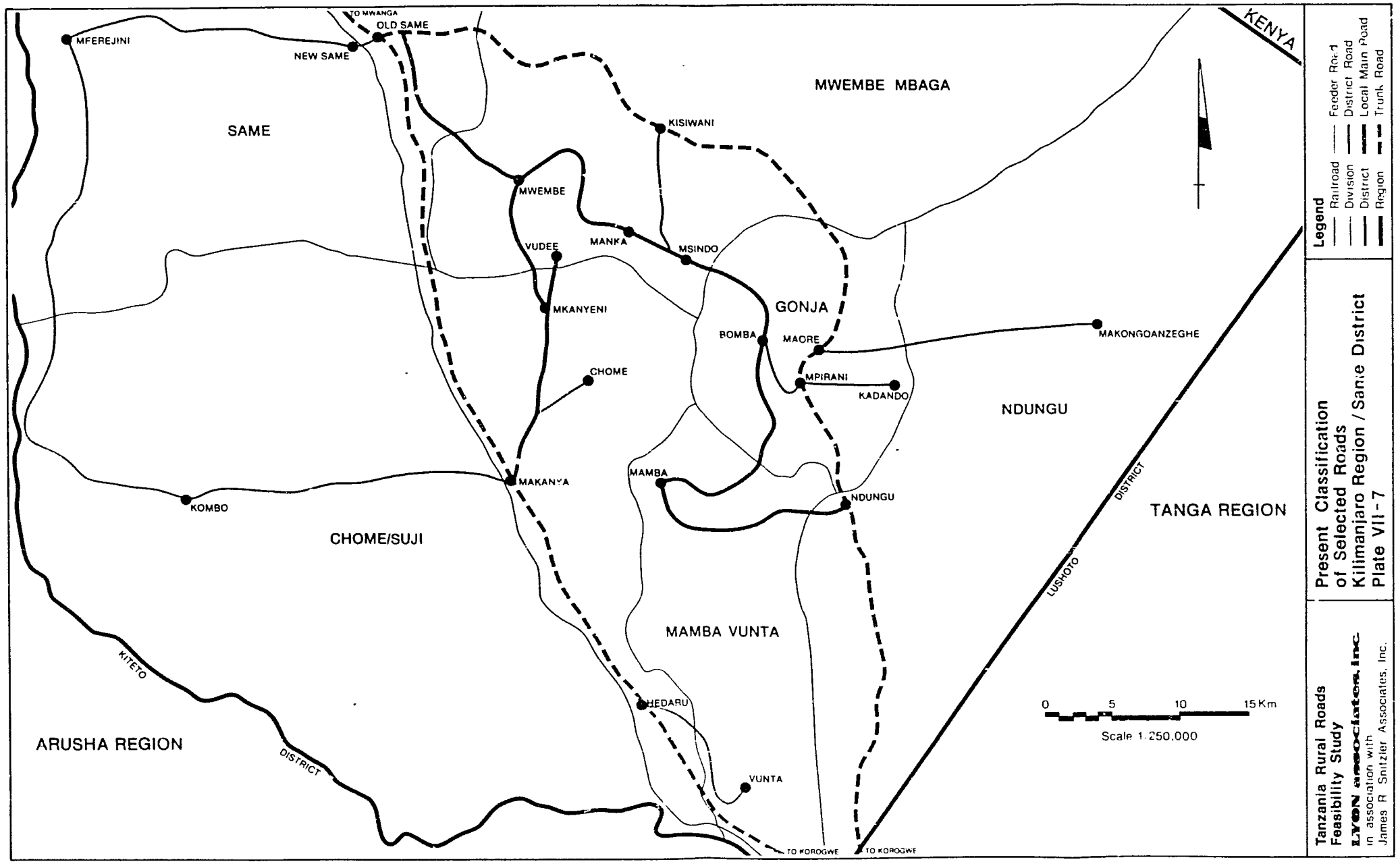


Legend

- Railroad — Feeder Road
- Division — District Road
- District — Local Main Road
- Region — Trunk Road

Present Classification of Selected Roads
Singida Region / Manyoni District
Plate VII-6

Tanzania Rural Roads Feasibility Study
LYON associates, inc.
in association with
James R. Snitzler Associates, Inc.


KENYA
TO MWANGA
OLD SAME
NEW SAME
MFEREJINI
SAME
MWEMBE MBAGA
KISIWANI
MWEMBE
MANKA
MSINDO
VUDEE
MKANYENI
GONJA
BOMBA
MAORE
MAKONGOANZEGHE
MPIRANI
KADANDO
CHOME
NDUNGU
MAKANYA
MAMBA
NDUNGU
KOMBO
CHOME/SUJI
TANGA REGION
DISTRICT
LUSHOTO
MAMBA VUNTA
KITETO
DISTRICT
HEDARU
ARUSHA REGION
VUNTA
TO KOROGWE
TO KOROGWE
0 5 10 15 Km
Scale 1:250,000
Legend
Railroad
Feeder Road
Division
District Road
District
Local Main Road
Region
Trunk Road
Present Classification
of Selected Roads
Kilimanjaro Region / Same District
Plate VII-7
Tanzania Rural Roads
Feasibility Study
LYON associates, Inc.
in association with
James R. Snitzler Associates, Inc.

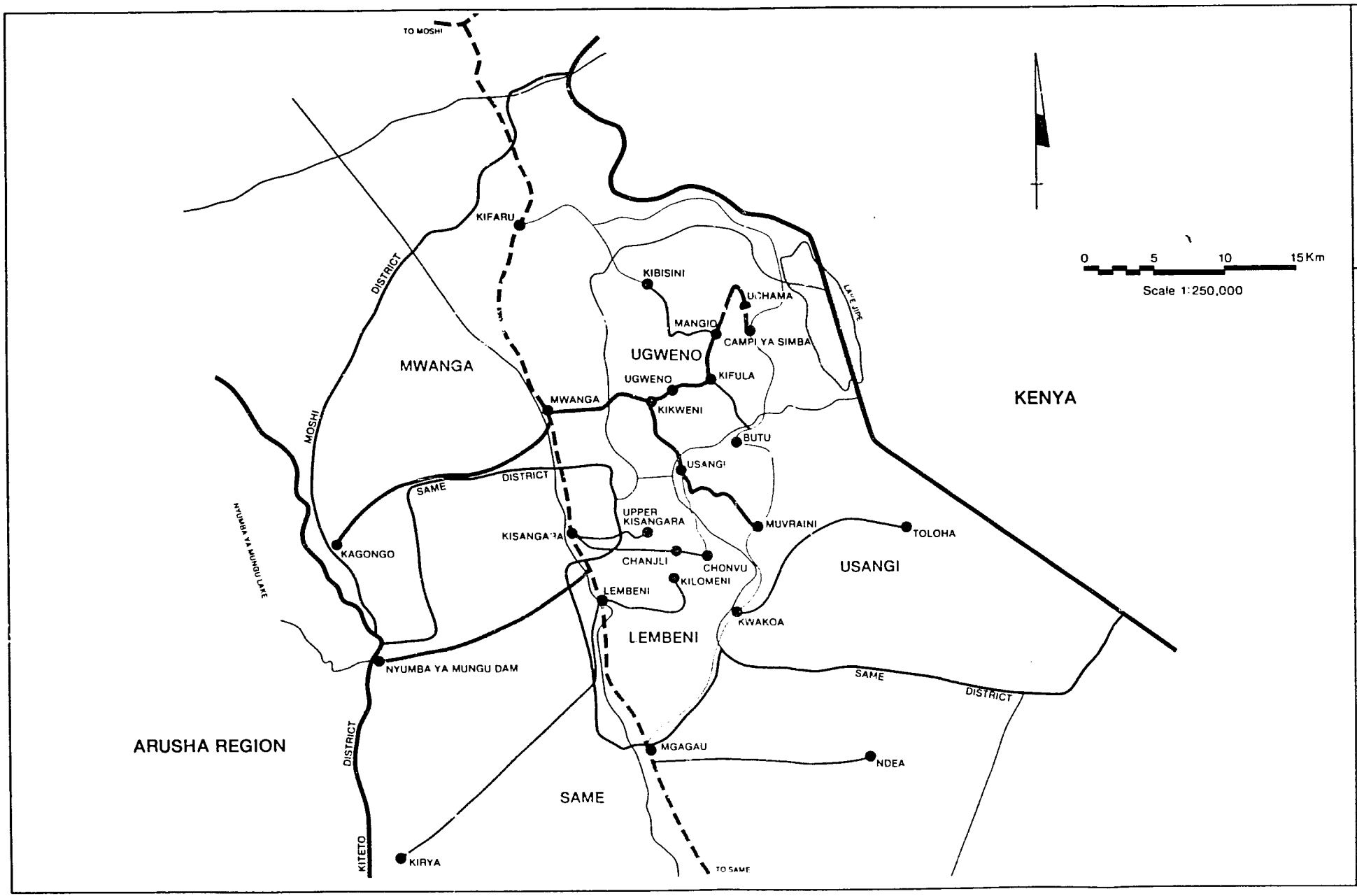

TO MOSHI
KIFARU
KIBISINI
UCHAMA
MANGIO
CAMPI YA SIMBA
UGWENO
KIFULA
UGWENO
MWANGA
KIKWENI
BUTU
USANGI
MUVRAINI
TOLOHA
UPPER KISANGARA
KISANGA'3A
CHANJLI
CHONVU
KILOMENI
LEMBENI
KWAKOA
KAGONGO
NYUMBA YA MUNGU DAM
MGAGAU
NDEA
KIRYA
TO SAME
MWANGA
DISTRICT
MOSHI
SAME
DISTRICT
NYUMBA YA MUNGU LAKE
KITETO
DISTRICT
ARUSHA REGION
SAME
LEMBENI
USANGI
KENYA
LAKE JIPE
SAME
DISTRICT
0 5 10 15 Km
Scale 1:250,000
Legend
Railroad
Feeder Road
Division
District Road
District
Local Main Road
Region
Trunk Road
Present Classification
of Selected Roads
Kilimanjaro Region / Mwanga District
Plate VII-8
Tanzania Rural Roads
Feasibility Study
LYON associates, Inc.
in association with
James R. Snitzler Associates, Inc.

TABLE VII-3

SUMMARY OF ROADS INVENTORIED BY THE FIELD TEAMS

		PRESENT CLASSIFICATION			
Region	District	Local Main	District	Feeder	Totals
Dodoma	Mpwapwa	98	89	0	187
	Dodoma	0	322	144	466
	Kondoa	166	167	24	168
	Subtotals	(264)	(578)	(168)	(1,010)
Singida	Singida	0	174	223	397
	Iramba	21	219	34	274
	Manyoni	0	89	105	194
	Subtotals	(21)	(482)	(362)	(865)
Kilimanjaro	Same	99	143	0	242
	Mwanga	63	4	61	128
	Subtotals	(162)	(147)	(61)	(370)
	TOTALS	447	1,207	591	2,245

See Table A-VII-2 of the Appendix for the details of the inventory.

NOTE: There is no Table VII-4.

The locations were verified, where possible, by comparing them with the physical features (streams, contours, area names, etc.) shown on available 1:50,000 scale maps. Maps at this scale are unavailable for most of Iramba District, south and west portions of Manyoni District, and the central portion of Same District. The least reliable maps were the district and regional maps with scales varying from 1:250,000 for the Kilimanjaro Region to 1:500,000 for the Singida Region. Other district and regional maps, showing the road classifications, were hand-drawn and are schematic only.

3. PRESENT MAINTENANCE PRACTICES

a. General

Systematic preventive maintenance has not been practiced in the project districts within the past few years as evidenced by the present condition of the majority of the roads examined. This condition prevails throughout Tanzania. Many of the roads have deteriorated to the point where they require complete rehabilitation of the roadway, ditches and drainage structures.

It is the considered opinion of the Study Team that the maintenance organization cannot function under the existing conditions, that little or no effective maintenance is being performed, and that, unless action is taken to rectify existing conditions, the roads will continue to deteriorate at an ever-increasing rate and require ever-increasing investments for rehabilitation and reconstruction. Moreover, rehabilitating the roads considered in this study without assurance that a follow-on maintenance program will be inaugurated and allowed to function with adequate manpower, equipment, facilities and funds to guarantee a continuing program will not be prudent use of these resources.

The conditions observed can be attributed to one or more of the following basic reasons:

(1) Lack of funds to make timely repairs or reconstruction.

(2) Lack of funds to make timely equipment replacements or supply spare parts.

(3) The neglect of maintenance and repair due to shortages of materials and trained manpower, or diversion to other areas.

(4) Increased cost of equipment, spare parts and materials not covered by proportionate increase in the allocation of funds.

(5) Lack of support for an adequate maintenance program versus support for new construction.

In addition to the foregoing, Tanzania specifically suffers from the obstacle of an insufficient number of qualified engineers, maintenance inspectors, foremen, equipment operators and mechanics as well as an unacceptably long time to return to operation of the equipment requiring overhaul or repair.

The foregoing problems are compounded at the district level by the fact that available equipment required for the maintenance of the roads within their area of responsibility is controlled by the Regional Engineer who is influenced by the Regional Development Director. The District Engineer is therefore unable to program the necessary maintenance activities in a reasonable manner since the equipment is used to perform work on projects other than highways at the discretion of higher authorities. In addition, funds budgeted for road maintenance can be diverted to other work, thus diluting an already inadequate allocation of highway maintenance.

With few exceptions, the only maintenance activities observed by the Study Team during their field examinations of the roads in the three regions consisted of scattered vegetation control and filling-in of potholes by hand labor. A few bridges and drifts were being repaired and some realignment construction was underway, but only a small part of the available manpower was actually observed working on the roads.

In the opinion of the Study Team, far more maintenance effort could be expended by the available manpower by using labor-intensive maintenance methods. For example, ditches could be cleaned and made to function with hand tools and culverts could also be cleaned and repaired or replaced. The roadway surface could be improved with drags. Areas with poor soils could, in many cases be mechanically stabilized with granular material available within a short distance. Short sections of embankments could be constructed over poor soils. With proper management, organization, and supervision, labor-intensive maintenance methods could be initiated that would alleviate much of the routine maintenance problems.

b. Organization

The term maintenance has been accepted to mean the act of preserving the right-of-way and travelway of the roadway facility as nearly as possible in its originally constructed or improved condition, and the operation of highway facilities to provide satisfactory and safe roadway transportation. This definition does not include any improvement to a higher standard, but does include repair of damage by floods, washouts, or other abnormal conditions.

A functioning highway maintenance program requires a definite organizational structure that is capable of organizing, planning and administering the program with adequate funding to permit the program to be implemented. A direct line of authority must be established from the responsible office with full control of the facilities, equipment and labor required for the program. The efforts of this organization cannot be permitted to be diluted by the assignment of duties of work outside of its prime objective, i.e., the maintenance of the highways for which it has the direct responsibility.

Discussions with responsible personnel in the project Regions and Districts reveal not only the absence of any direct organizational structure for highway maintenance, but also a serious shortage of equipment, repair facilities, and supervisory personnel down to the roads inspector and foreman level, as well as qualified equipment operators and mechanics.

The maintenance of a highway can be broken down into these distinct tasks:

(1) Routine maintenance, which includes vegetation control, ditch, culvert and drift cleaning, patching potholes and ditch shaping, and surface blading to maintain a smooth crowned roadway surface. These tasks are performed by a regular maintenance crew.

(2) Periodic maintenance, which is a more extensive maintenance operation, such as resurfacing, to replace lost granular surface material and is normally scheduled every few years.

(3) Rehabilitation and Preventive Maintenance which includes such tasks as repair of damaged drainage structures, erosion and scour damage, damage to bridge super-structures and abutments, channel cleaning, sign replacement. These tasks cannot be regularly scheduled and are performed on an "as needed" basis.

None of these tasks as described above are regularly or effectively being performed at this time on the roads covered by the Study Team.

In summary, the maintenance of the highways in the study area suffers from the present organizational structure, the shortage of trained and experienced staff and skilled workers, the lack of operational equipment and adequate workshop facilities, as well as a less than minimal allocation of funds. As a result of these circumstances, only sporadic work, usually on an emergency basis, is being accomplished and the road system is in extremely poor condition.

C. Design Standards

1. Roads

a. Existing Design Standards

The Ministry of Works is in the process of revising the Road Manual portion of their standards; however, the Consultant was provided with a marked-up draft copy of pertinent portions of the revised document. A copy of the pertinent portions of the revised Manual is presented in Table A-VII-1 of the Appendix. In Section 1.1.3, the Manual presents and defines the following existing five road categories:

Trunk Roads
Local Main Roads
Regional Roads
District Roads
Unclassified Roads

For design purposes, Section 1.1.5 of the Manual now divides the roads into six categories:

Trunk Roads
Local Main Roads
Regional Roads
District Roads
Major Feeder Roads
Minor Feeder Roads (Farm to market roads)

Table 1.1.6 of the Manual presents the minimum design criteria for carriageway widths, shoulder widths, bridge loadings, and right-of-way widths for the above classifications. Sections 1.2 through 1.8 of the Manual present the detailed design standards that are concerned with traffic volumes, design speeds, and geometrics.

The Ministry of Works revised Roads Manual was compared with criteria for low volume roads presented in other

reports. 1/2/3/4/

The revised Ministry of Works classifications and some of the proposed design standards (such as superelevation transitions) are considered to be too sophisticated for this project, especially when the alignments are going to be field designed as described in Sections VII D. and VII-E. More realistic design standards for the roads being considered are presented as design specifications in Annex D of ARPVD. 3/ The Study Team concurs with the ARPVD proposed revisions to the existing Ministry of Works Road Manual, as shown in Table A-VII-1, with the following qualifications:

b. Proposed Changes to the Roads Manual

(1) Classification

The Trunk Roads form the primary system that carries the higher volumes of traffic between administrative regions and are not in the scope of work for this project. All other roads are actually low volume roads that connect the population centers to each other and to the Trunk Roads, while also providing access to adjacent property. Almost all of these roads evolved from trails and tracks with little or no benefit of design standards current at the time of reconstruction or upgrading. Administrative class is not usually significant as a classifying factor. A road should not be reconstructed to a higher standard than is justified by traffic volume, merely because of its administrative classification. The design standards

---

1/ Transportation Research Board, National Academy of Sciences, Washington, DC
a. "Transportation Technology, Support for Developing Countries." TTSDC, Compendiums 1 through 10, 1978.
b. "Low Volume Roads." Special Report 160. Proceedings of a workshop held June 16-19, 1971, in Boise, Idaho, 1975. 396 p.
c. Maintenance of Unpaved Roads TTSDC Synthesis 1 and Stage Constr., Synthesis 2,1979
d. "Low Volume Roads: Second International Conference", Transportation Research Record 702, 1979.
2/ Opportunities for Cost Reduction in the Design of Transport Facilities for Developing Regions. Volumes 1 and 2. Institute of Transportation and Traffic Engineering, University of California, March 1970.
3/ Tanzania, Arusha Planning and Village Development Project, Project Paper No. 620-0143, USAID, July 1978.
4/ Rural Access Roads Programme, Annual Review and Evaluation Meeting 1979 Discussion Papers, Ministry of Works, Republic of Kenya.

as presented in the revised manual should be applied to new construction, or to reconstruction when traffic volumes warrant upgrading.

(2) Roadway Width

Varying the two lane carriageway widths as shown in Section 1.1.6 of the Manual from 5.5 to 6.0 to 6.5 meters is not justified. 5.5 meters is the minimum width recommended for a two lane roadway, since 2.74 meters is the absolute minimum for one-way operation of a 2.5 meter wide vehicle. Therefore, 5.5 meters is recommended as the minimum in mountainous terrain for short sections of road where excessive excavation would be required for greater width. Widening the roadbed to provide shoulders is not recommended for these low volume roads; however, the roadway should be constructed wide enough to allow additional room for maneuvering during passing in both directions.

Due to very low traffic volumes, only one or two lane roads are required. One lane roadways are sufficient for daily traffic or less than 50 vehicles. Existing one lane roadways should be maintained as such and need not be widened until ADT exceeds 50.

The width of rehabilitated roadways should be increased to 7.0 meters, however, regardless of traffic levels. This is simply due to the reshaping operations. It requires the same amount of time to shape one roadbed width as it does to shape two. The added roadway width involves only minor increases in culvert costs as the major cost of a culvert is in the headwall and erosion protection, which have to be constructed for either a one or two lane roadbed. A 7.0 meter wide roadbed is the widest roadbed that can be shaped efficiently with two passes of a standard 4.27 meter (14 foot) grader blade. It is for this reason that a two-lane 7.0 meter wide roadway is recommended for the rehabilitated roads.

Surfacing material may be applied only to the central portion, in effect producing a single-lane granular-surfaced road with unsurfaced shoulders for passing. Surfacing material is easily applied to the full width when traffic warrants doing so.

(3) Design Speed

The width of the roadway has been established as two lanes (5.5 or 7.0 meters). The design speed determines geometrics of the roadway such as horizontal curve radii and sight distances. The design speed is a function of the terrain, with lower design

speeds being applicable for winding alignments in rolling and mountainous terrains, and higher design speeds being applicable in level terrain.

Level Terrain is that condition where vertical and horizontal roadway sight distances are generally long.

Rolling Terrain is that condition where the natural slopes consistently rise and fall below the roadway grade line, and occasional steep slopes offer some restriction to more desirable vertical and horizontal alignments.

Mountainous terrain is that condition where longitudinal and transverse changes in the elevation of the ground with respect to the roadway are abrupt, and where the roadbed is obtained by frequent benching or side hill excavation.

The study team agrees with the following recommended minimum design speeds as shown in Table 1.8.1 of the Manual:

Level Terrain	60 kph
Rolling Terrain	40 kph
Mountainous Terrain	30 kph

Although the Manual shows a capacity of 20 vehicles per day for these design speeds, these speeds can handle up to 50 vehicles per day. Unfortunately, there is no existing or historical traffic data available for the study roads; however, based on observations during the field visits and discussions with Government Engineers, the current and likely near-future traffic on most of these roads far less than 50 vehicles per day. These minimum design speeds will be used where it is desirable to reduce costs by retaining existing alignments that have sharp curves in rolling terrain. Since the main function of lightly travelled roads is to provide access to main arteries and to connect population centers, rather than to allow high speed travel, high design speeds should be the exception and not the rule.

(4) The following drainage design standards should be added to the Roads Manual:

(a) Hydrology

The quantity of runoff can be determined by the Rational Formula:

$$Q = K(I-F)CA$$

where Q = Runoff in cubic meters per second

K = Constant to convert from English to metric units

I = Rainfall intensity in millimeters per hour

F = Infiltration in millimeters per hour

C = Coefficient representing the ratio of runoff to rainfall.

A = Area of drainage basin in hectares

The rainfall intensity I must be determined from intensity - duration curves that are developed statistically from long periods of rainfall records. The Department of Meteorology in Dar es Salaam has 50 years of records on computer print-outs, but no intensity-duration curves were available from the Department. A precipitation-intensity curve was obtained from the University of Dar es Salaam, Department of Civil Engineering (See Figure VII-1). This curve shows values of liters per second per hectare (Q/A) versus time for various regions and recurrence intervals. Efforts should be made to either obtain (or prepare) more detailed intensity-duration curves for rainfall stations closer to the roads. The values of infiltration F and coefficient C are selected by the design engineers, and are based on an inspection of the drainage area. The times of concentration are determined by adding the successive downstream channel travel times to the overland flow time of the initial drainage area.

The design frequency for culverts should be 10 years, and for bridges 50 years.

(b) Hydraulic Design

The head losses in culverts and ditches can be determined by applying two basic formulas:

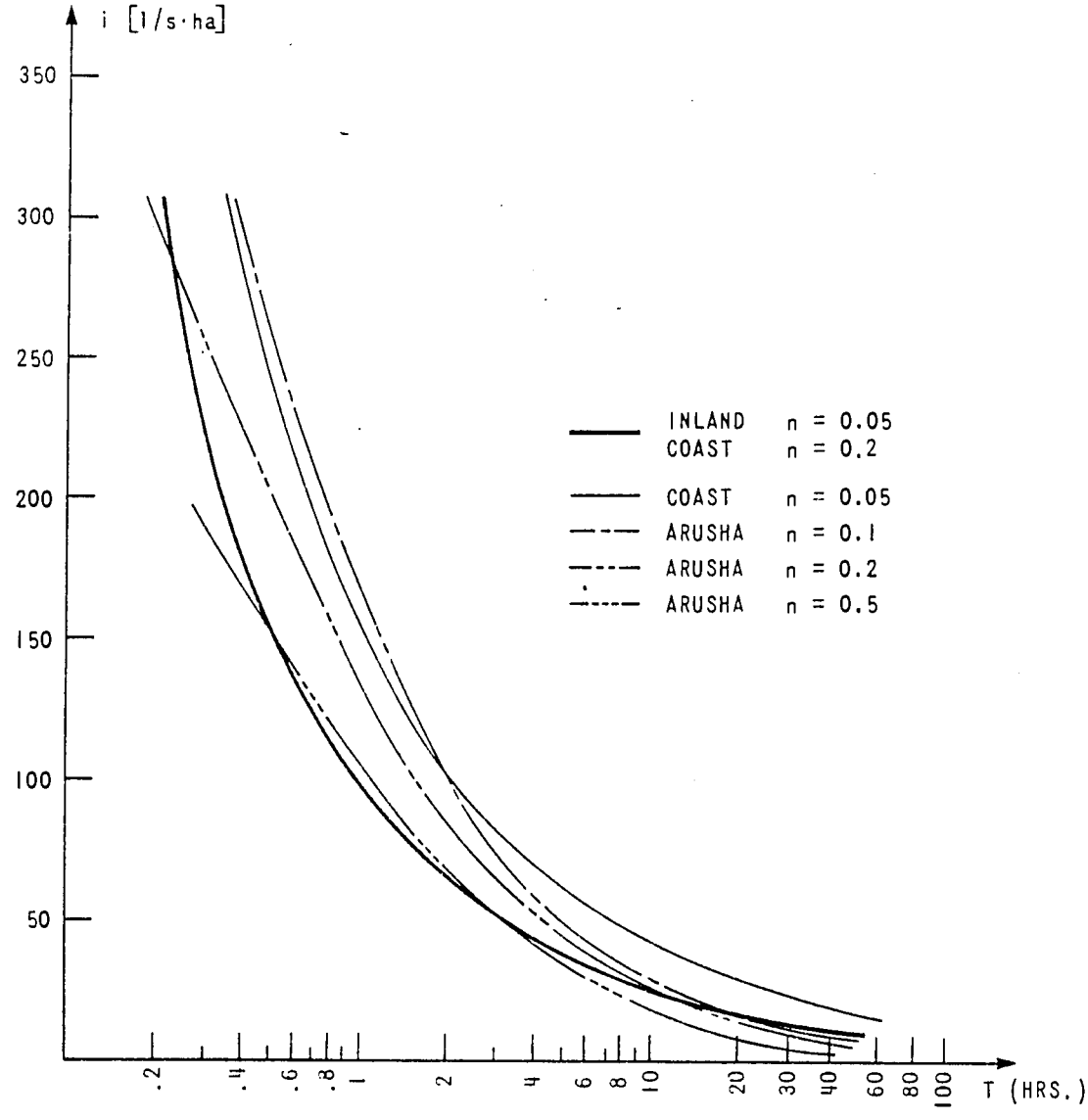
$$Q = AV$$

where Q = Flow in cubic meters per second

A = Area in square meters

V = Velocity in meters per second

and $$V = K \frac{1.486}{n} R^{2/3} S^{1/2}$$



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2. MTWARA-LINDI. WATER MASTER PLAN.
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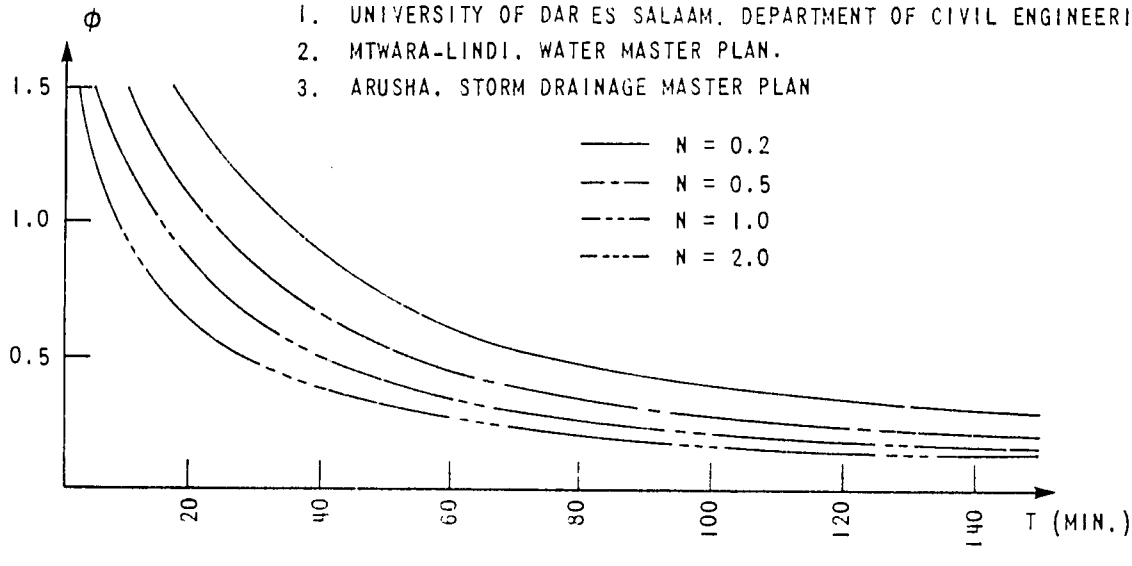


INTENSITY-DURATION RELATION OF RAINFALL FOR DIFFERENT FREQUENCIES OF OCCURENCE.

$$r_{(T.n)} = \phi \cdot r_{(15.1)} \; : \; \phi = \frac{38}{T+9}\left(\frac{1}{n} - 0.369\right)$$

(FORMULA OF REINHOLD)

FIGURE VII-1
RAINFALL INTENSITY DURATION CURVES

where K = Constant to convert from English to metric units

n = Roughness coefficient of culvert or ditch material

R = Hydraulic radius in meters

S = Longitudinal slope of hydraulic gradient.

The hydraulic design of culverts and ditches is an engineering art that requires education, experience and good engineering judgement.

2. Stream Crossings, Bridges and Drifts

a. Review of Design Standards

There are no design standards maintained for bridges and drifts at the district or regional level. Designs for major bridges are prepared at the Ministry of Works headquarters in Dar es Salaam and constructed often under their direct supervision. In an effort to streamline the design standards for bridges, the Ministry has prepared guidelines which require the minimum width of bridges on District, Major Feeder and Minor Feeder roads to be one meter wider than the road carriageway width. When designed to the minimum standard, such bridges will essentially be single-lane, ranging in width from 4 to 5 meters. From economic considerations and the fact that the current and likely future traffic on these roads is far less than 50 vehicles per day, single-laned bridges up to 5 meters wide should prove adequate and acceptable for the roads under consideration in this project.

(1) Traffic Loading

The traffic on these roads is highly seasonal and consists mainly of government vehicles (Landrovers) operated by local administrative authorities, and some road maintenance equipment. Truck traffic, the majority of which are single unit vehicles with either a single or tandem rear axle, is predominant mainly during the harvest months, June to September. Very few, if any, tractor-trailer combination vehicles ever use these roads.

The current legal axle load limit is 5 tons on the front and 8 tons on rear axles; however, with general lack of enforcement and trend towards importation of heavier vehicles, these trucks are often overloaded. In light of these facts and the economics of

long distance haulage involved, the Ministry is presently considering raising the axle load limit from 8 to 10 tons. Under these circumstances, the AASHTO H15 design load, also stipulated by the Ministry of Works' guidelines for design of new bridges on District, Major Feeder and Minor Feeder roads, should prove adequate.

b. Review of Existing Structures

Table A-VII-3 in the Appendix shows an inventory of existing bridges and drifts that were observed by the field teams in a survey of over 2,200 kms. of road in the three regions. Most structures vary in age from three to ten years, although a few were found to be as much as twenty years old.

(1) Bridges

The bridges are mostly solid concrete slabs supported on masonry abutments varying in span length from one to ten meters. A few bridges in Dodoma Rural and Mpwapwa districts were found to be deck type concrete slabs on steel girders.

The width varies from 3 to 5 meters and most require some form of side railings or end pillars to indicate the narrow width. With the exception of those bridges that need to be replaced, widening of existing bridges to conform to the proposed minimum standard is not considered necessary at this stage.

Since no design drawings or standards for existing structures were available, it was not possible to assess the structural adequacy of existing bridges; however, most slabs are 200 to 300 mm thick and, with few exceptions, do not show any sign of structural failure. On the other hand, a significant amount of scour under the abutments and around wingwalls on the downstream side was noted. This stems from the very shallow depth to which most piers and abutments have been constructed, and from not providing adequate erosion protection on the downstream side.

Major repair activities on existing bridges will involve provision of adequate erosion control including bank protection,

provision of side railings or parapets, repair of minor cracks in the abutments under the bearings, and provision of adequate advance warning signs.

(2) Drifts

The drifts (or paved fords) are the low-water crossings placed across dry river beds or where the water is shallow most of the year round. The drifts were found to be constructed of mass concrete or grouted stone slabs, placed directly on the stream bed with practically no protection against erosion. As a result, a significant amount of scouring was observed under the downstream edge of the drifts, often resulting in complete or partial collapse of the slab.

The existing drifts are generally 3 to 4 meters wide and vary in length from 10 to 30 meters. Like the case of bridges, widening of existing drifts that are in good condition is not deemed necessary; however, adequate protection against scour must be provided on almost all of the existing drifts in the form of a filter and/or a grouted stone apron extending 3 to 4 meters on the downstream side.

D. Proposed Rehabilitation

1. Roadway

As discussed in Section VII.B., most of the existing roadways in level and hilly terrain are depressed below the level of the adjacent ground. While the existing horizontal alignments need minor relocations to reduce the number of sharp curves. At the same time, the highway engineer will have to consider the best location of the roadway to correct sections of "roller coaster" type vertical alignments, where there are alternating summits and low points every 20 to 30 meters. One example of this type of road occurs in the northerly section of the Pandambili to Mlali Road in Mpwapwa District. These minor re-alignments, combined with proper elevation and side ditches, would also reduce the numbers of culverts required. A section of the road between Chidilo and Handali in Dodoma District of one kilometer has 12 unnecessary culverts.

Figure VII-2 illustrates how the roadway will be reshaped with material to be excavated from the drainage ditches. A surface layer of granular material is also shown. Figure VII-3 illustrates the procedure to be used to widen an existing narrow roadway embankment. Such road sections are rare; Figure VII-2 shows the far more common condition.

Rolling terrain will involve some cut sections such as shown in Figure VII-4, as well as some fill sections. Most of the roads inspected in rolling terrain had few cut sections as most of the slopes of the natural terrain are within acceptable limits for roadway grades.

It is expected that the existing alignments in mountainous terrain will be used since new alignments would involve massive amounts of earthwork and many new culverts and bridges, an effort beyond the scope of the present project. The roadways are literally carved out of the sides of mountain slopes. The majority of the mountainous roads are in the Mwanga and Same districts of Kilimanjaro Region. The maximum existing longitudinal gradients are relatively flat (about 6%) for mountainous terrain, and therefore result in long roads. The transverse mountain slopes are also relatively flat, so the heights of the cut slopes seldom exceed 3 or 4 meters on the uphill slopes; however, they are not flat enough to allow significant amounts of stable fill to be placed on the downhill slopes for widening the roadway.

The main deficiencies of the mountain roads are lack of adequate side ditches on the uphill slopes, slopes steeper than the angle of repose, unstable angles of repose of the uphill slopes, and poorly shaped transverse roadway slopes (crowns). These factors combine to cause the uphill drainage runoff to come on and across the roadway, causing erosion of the surface of the roadway. Even though most of the observed uphill cut slopes were residual soil and weathered fragmented rocks, their steepness resulted in extensive areas of minor slope failures that deposited the fallen material in the ditches and on the roadway.

Typical section recommended for mountainous terrain is illustrated in Figure VII-5. The full roadway width should be in cut sections, not partly on side-hill fill. Any widening should be cut into the hillside.

2. Drainage

a. Small Pipe Culverts

Most of these are single 60 cm and 90 cm diameter concrete or corrugated metal pipes. Many of these pipe culverts are constructed too low, resulting in long, flat outlet ditches to daylight. This in turn results in sedimentation in the outlet ditch and eventually the culvert, thereby reducing the capacity of the culvert. This also increases the maintenance of cleaning these culverts and ditches. Many of the culverts have no headwalls on either end, resulting in scour of the downstream ditch, and undermining and eventual breakage of the downstream end of the culvert. To compound these deficiencies, some of the culverts have so little cover over the top that the tops of the pipes are exposed to direct contact with the vehicle tires. The impact has collapsed many of the culverts. It is recommended that all new culverts be constructed of concrete pipe with masonry headwalls, aprons, cutoff walls, and wingwalls at each end. As discussed in Section VII.E, the culvert fabrication team can precast these pipes at each of the four proposed District Maintenance shops with a saving in foreign exchange costs. Erosion protection such as grouted stones or gabions must also be provided at the outlet end of the masonry apron. The highway engineer will determine the locations, sizes, elevations, and lengths of the culverts. The details of the

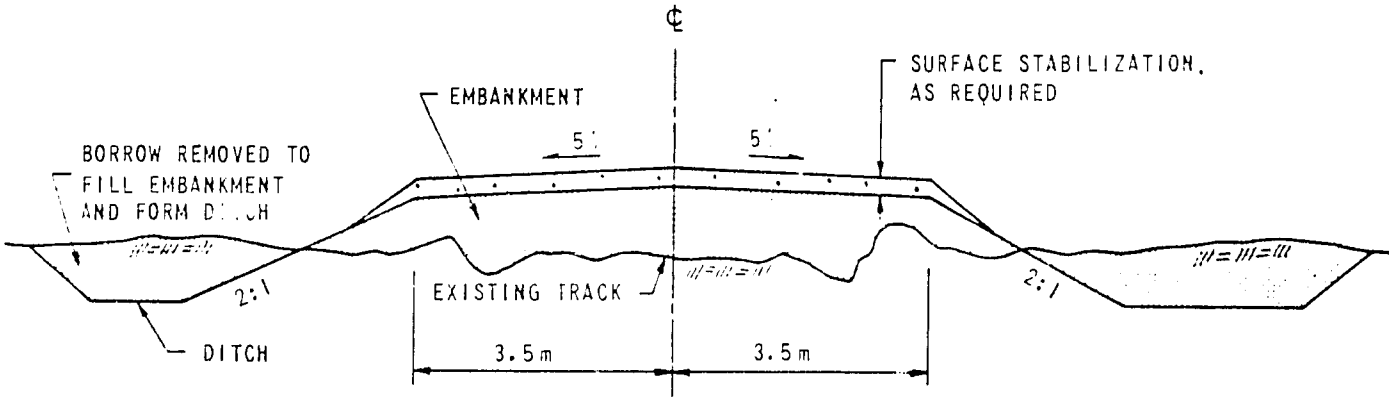


FIGURE VII-2

TYPICAL SECTION OVER OLD TRACK IN FLAT TERRAIN

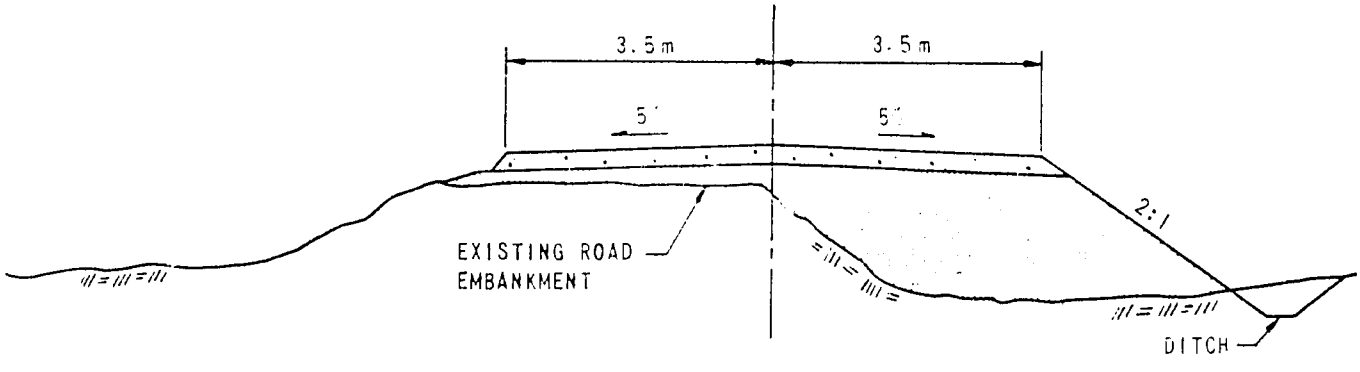


FIGURE VII-3

TYPICAL EMBANKMENT FILL SECTION IN FLAT TERRAIN

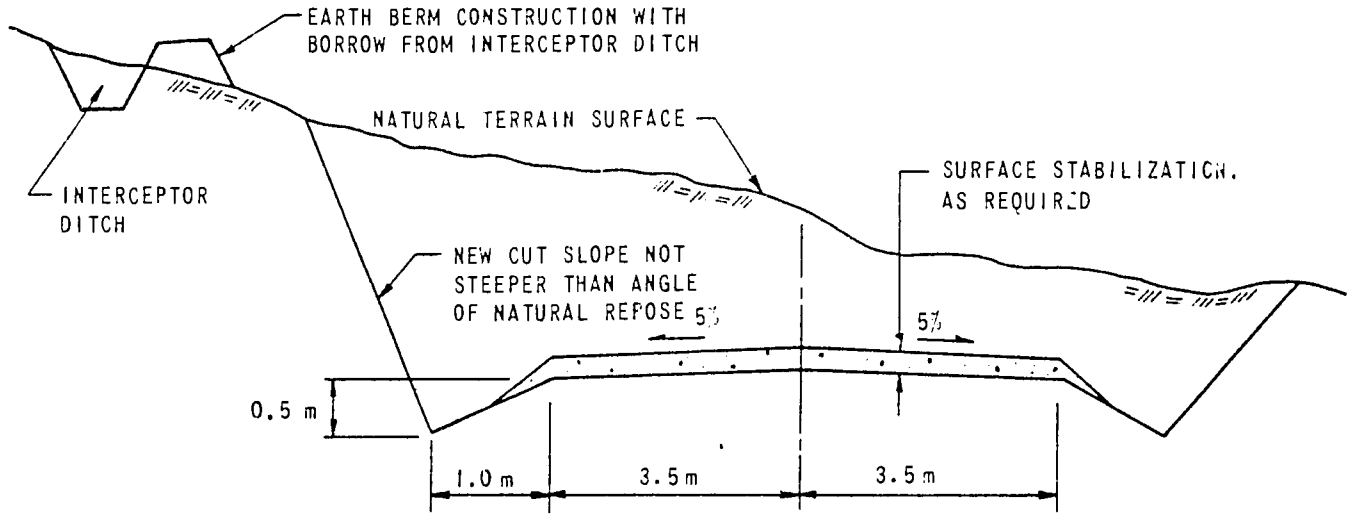


FIGURE VII-4

TYPICAL CUT SECTION IN ROLLING TERRAIN

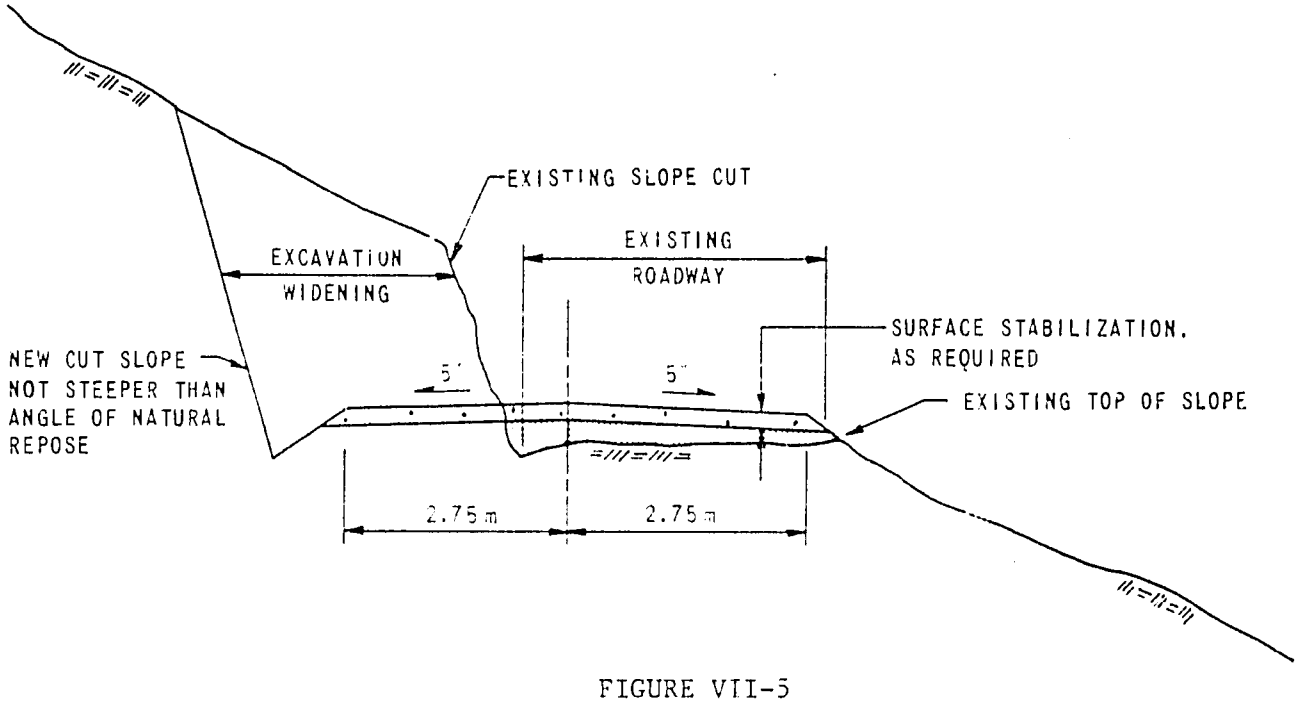


FIGURE VII-5

TYPICAL SECTION IN MOUNTAINOUS TERRAIN

headwalls, aprons, wingwalls, cutoff walls, and erosion protection should be standardized by the engineer to assure adequate construction. The minimum cover over these culverts should be 60 cm.

b. Side Ditches

It is apparent from the preceding discussion that the low roadbeds create poor drainage. In fact, the roadbed itself becomes the drainage channel resulting in transverse and longitudinal erosion of the roadbed. To counteract this problem, side ditches were constructed 2 or 3 meters parallel to the roadway, a berm was constructed between the roadway and these side drains, and ditches were constructed at about 10-meter intervals, through the berms at a 45 degree angle, to drain the roadway to the side ditches. These connecting ditches are called mitre or contour drains, and are also used without the side ditches to drain the roadway into adjacent fields and nearby drainage ditches. Even if these systems are maintained properly, they are not recommended. On flat grades, the run-off backs up onto the roadway through the mitre drains, and the roadway becomes the channel because the water is trapped between the berms. Also, the mitre drains become clogged from the sedimentation, with the same result. The mitre drains also greatly, and unnecessarily, increase the lengths of ditches to be maintained. The side ditches shown on the typical sections of Figures VII-2 through VII-5 will provide adequate drainage with minimal maintenance.

c. Bridges and Drifts

(1) Bridges

For economic reasons, it is advisable that due consideration be given to alternative methods for efficient transfer of water across the road at stream crossings before recommending a bridge. Smaller drainage structures, particularly comprised of one or more corrugated metal pipes (circular, elliptical or arched), designed on the basis of a ten-year storm may often prove more economical when risks of damage to the road structure or adjoining land use are small from an exceptional flood.

Most of the bridges required in the current project area are one or two span, with span lengths varying from 4 to 7 meters. These bridges, if designed to the AASHTO H15 design load, should prove adequate to pass the current and likely future traffic on the roads under consideration.

(a) Superstructure

On short superstructure spans, less than 6 meters, it is recommend the bridge be designed as a solid slab spanning between the abutments. See Figure VII-6(a). On spans greater than 6 meters, a beam and slab combination structure of the type shown in Figure VII-6(b) should be used.

(b) Substructure

The superstructure should be supported on concrete or masonry abutments and piers of the types shown in Figure VII-7. The piers should be tapered at both ends to facilitate smooth flow of water, thereby reducing their scouring action. The foundations must be deep enough to avoid the type of scouring observed under existing abutments and piers. They must be at least one meter deep and rest directly on suitable soil stratum. Though unlikely, the need for piles should not be precluded where the soil consists of highly unstable deposits or where there is evidence of buried valleys infilled with deposits of alluvium. A continuous back drain or weepholes must be provided in situations where water could accumulate behind the abutments.

(c) Erosion Control

Wing walls of masonry construction on both sides of the bridge mus be provided extending as far as necessary to prevent bank erosion and scouring around the abutments. Where abutments and piers are not founde on bedrock, paving of the riverbed or protection by rip rap should be considered. In some situations, realignment of the watercourse may be necessary in order to improve the angle of crossing.

(2) Drifts

Drifts are recommended at places where the watercourse is normally dry except for a few days per year during heavy rains. Figure VII-8 shows a sketch of the recommended design which makes little use of equipment and maximum use of locally available

materials. The design consists essentially of a gravel and stone layer 4 to 5 m wide placed on a rock-piled bed between two gabion walls, constructed flush with the river bed. A rubble masonry apron is provided downstream to protect against scour.

d. Cost Estimates

(1) New Structures

The cost of constructing an 18 meters long drift of the type recommended (Figure VII-8) is estimated at T/shs 22,000 or approximately T/shs 1,225 per meter.

Single lane bridges, 4.5 meters wide and made from reinforced concrete, are estimated to cost T/shs 6,800 per meter for single span and T/shs 7,500 and T/shs 8,000 per meter for two and more than two spans, respectively. These costs are based on T/shs 2,000 per cubic meter of masonry constructed wingwalls.

Since only a sample of the roads under consideration were actually surveyed by the study team, it was necessary to estimate the number of structures required on the remaining roads. This was done by averaging the number of structures required per unit length from Table A-VII-3 in the Appendix. The results are summarized in Table VII-5. Table VII-6 summarizes the number of additional structures required in each region as computed by using the averages obtained in Table VII-5. Table VII-7 summarizes the total number and estimated cost of new structures required in Dodoma and Singida Regions, and the Same and Mwanga Districts of Kilimanjaro Region.

(2) Repair of Existing Structures

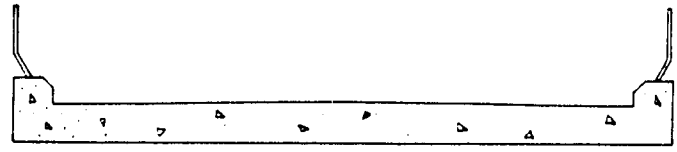
The number of bridges and drifts that may require repair in addition to those listed in Table A-VII-3 were estimated again by proportioning them according to the total number of kilometers of road to be upgraded in each region. Repair costs are posted as a lump sum of T/shs 5,000 per drift and T/shs 8,000 per bridge. The total cost of repair for each region is summarized in Table VII-8.

(3) Total Cost

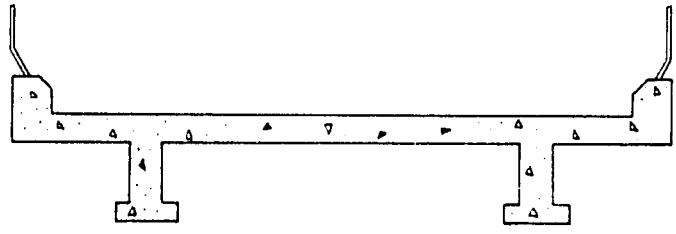
The total cost of repairing existing and constructing new bridges and drifts is summarized in Table VII-9 for each of the three regions. Except for the cost of equipment such as concrete mixers, vibrators, and transport vehicles, most of the costs can be met in local currency.

(4) Priorities

The repair of existing bridges and drifts or the construction of new structures should follow the rehabilitation priority schedule of the corresponding roadway. No individual bridges or drifts were identified by the District Engineers as having significantly differen priorities.



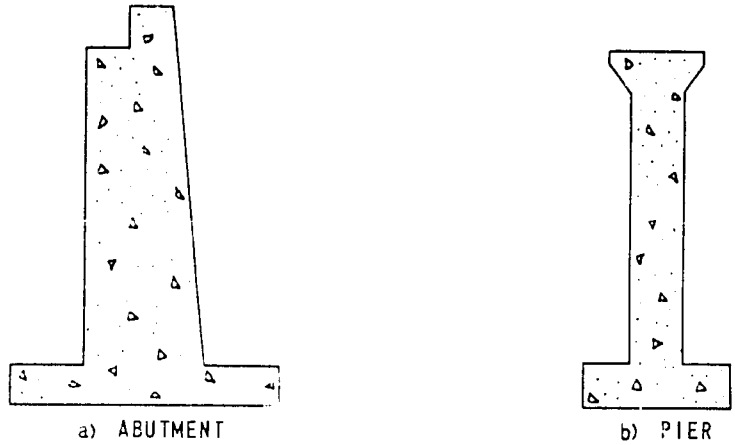
a) SOLID SLAB



b) BEAM AND SLAB COMBINATION

FIGURE VII--6

BRIDGE SUPERSTRUCTURE



a) ABUTMENT b) PIER

FIGURE VII-7

BRIDGE SUBSTRUCTURE

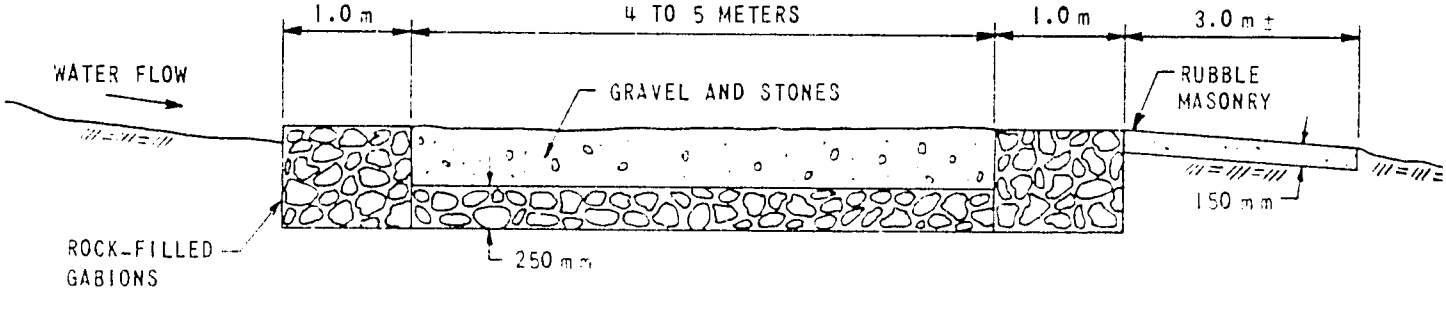


FIGURE VII-8

DRIFT CROSS-SECTION

TABLE VII-5 NUMBER OF NEW STRUCTURES REQUIRED PER UNIT LENGTH

New Structures	Dodoma Region	Singida Region	Same/Mwanga Districts
Drifts (per 100 Km)	4.0	1.3	11.0
Bridges (per 500 Km)			
One-Span	3.0	6.0	4.0
Two-Span	2.0	4.0	1.4
Multiple-Span	2.0	3.0	1.4

TABLE VII-6 ESTIMATE OF DRIFTS AND BRIDGES REQUIRED ON ROADS NOT INCLUDED IN TABLE A-VII-3

	Dodoma Region	Singida Region	Same/Mwanga Districts
Drifts (per 100 Km)	55	6	30
Bridges (per 500 Km)			
One-Span	8	8	2
Two-Span	6	5	1
Multiple-Span	6	4	1

TABLE VII-7 ESTIMATED COST OF ALL NEW DRIFTS AND BRIDGES

A. DODOMA REGION

Structure	Avg.Length (m)	Number Required From Table A-VII-3	Number Required From Table VII-6	Total	Total Cost (T/Shs)
Drifts	18	35	55	90	1,980,000
Bridges					
One-Span	5	10	8	18	612,000
Two-Span	10	3	6	9	675,000
Multiple-Span	20	3	6	9	1,440,000
		COST OF NEW STRUCTURES:			4,707,000

B. SINGIDA REGION

Drifts	18	8	6	14	308,000
Bridges					
One-Span	5	5	8	13	442,000
Two-Span	10	3	5	8	600,000
Multiple Span	15	5	4	9	1,080,000
		COST OF NEW STRUCTURES:			2,430,000

C. SAME/MWANGA DISTRICTS OF KILIMAJARO REGION

Drifts	18	39	30	69	1,518,000
Bridges					
One-Span	5	3	2	5	170,000
Two-Span	10	1	1	2	150,000
Multiple-Span	30	1	1	2	480,000
		COST OF NEW STRUCTURES:			2,318,000

TABLE VII-8 ESTIMATED REPAIR COST OF EXISTING STRUCTURES

	Dodoma Region	Singida Region	Same/Mwanga Districts
No. of Drifts	32	16	27
No. of Bridges	42	10	5
Total Cost (T/shs)	496,000	160,000	175,000

TABLE VII-9 SUMMARY OF TOTAL COSTS (BRIDGES AND DRIFTS)

Type of Cost	Dodoma Region	Singida Region	Same/Mwanga Districts	Total Costs (T/shs)
New Construction	4,707,000	2,430,000	2,318,000	9,455,000
Repair	496,000	160,000	175,000	831,000
Total Costs (T/shs)	5,203,000	2,590,000	2,493,000	10,286,000

3. Road Selection

During the field investigations, each District and Regional Engineer was contacted and asked to furnish a list of all roads carried on their inventory. They also furnished maps showing existing road classifications and locations. Discussions were held with the District Engineer and his staff as to which of the roads were considered the most important, the order of priority within the District(regional priorities were not available), and the reasons for these priorities. They identified and discussed 4,336 kilometers of roads, which are summarized in Table VII-10, and listed in Table VII-11. All of these roads were selected for rehabilitation, and their locations are shown on Plates VII-1 thru VII-8.

In Section VI, priorities were determined for the administrative divisions. These divisional priorities were determined on a regional basis, without regard to the administrative districts. The divisions are shown on Plates VII-1 through VII-8, which show the selected roads and classification by districts. Plates IV-3 through IV-5 show the locations of the divisions and districts within each region. The divisional priorities described above were used as the basis of the construction schedule with roads serving the higher priority divisions within the region. The division rankings could not be followed exactly, because obviously roads will cross the division boundaries. The division rankings were further subordinated to the requirements of minimizing the numbers of moves to be made by the construction teams. The surface stabilization (graveling) is to be performed as soon after the roadbed is rehabilitated as possible; however, since all of the surface stabilization cannot be performed during the three year period, surface stabilization is recommended generally to those roads that connect district or trading centers to trunk roads, or to roads that collect traffic from other roads. Surface stabilization was generally not provided for "dead end" roads.

TABLE VII-10

SUMMARY OF ROADS SELECTED FOR REHABILITATION

		PRESENT CLASSIFICATION			
Region	District	Local Main	District	Feeder	Totals
Dodoma	Mpwapwa	112	301	230	643
	Dodoma	0	481	616	1,097
	Kondoa	155	247	136	538
	Subtotals	(267)	(1,029)	(982)	(2,278)
Singida	Singida	0	196	154	350
	Iramba	24	250	183	457
	Manyoni	0	82	486	568
	Subtotals	(24)	(528)	(823)	(1,375)
Kilimanjaro	Same	163	198	0	361
	Mwanga	93	127	102	322
	Subtotals	(256)	(325)	(102)	(683)
	TOTALS	547	1,882	1,907	4,336

TABLE VII-11

LIST OF ROADS SELECTED FOR REHABILITATION

A. Dodoma Region

1. Mpwapwa District

Present Classifications/Description	Length (km)
a. Local Main Roads	
Nghambi-Mowapwa Mlali	81
Mpwapwa-Gulwe	15
Matomondo-Godegode	16
Total Local Main Roads	112 km
b. District Roads	
Trunk Road - Zoissa	63
Mlali-Pandambili	24
Trunk Road - Kongwa	3*
Kongwa - Suguta	40
Chunyu - Msagali	10
Gulwe - Rudi	74
Kibakwe - Mwana Wota	23
Gulwe - Fufu	64
Total District Roads	301 km
c. Feeder Roads	
Trunk Road - Vilundilo	10
Godegode-Mbuga	75
Kibakwe/Rudi Road - Massa - Idodoma	78
Rudi - Chipogoro	37
Igoji- Mtamba	30
Total Feeder Roads	230 km

2. Dodoma District

a. Local Main Roads	None
b. District Roads	
Dodoma-Myumi - Mkulabi	41
Trunk Road - Kikombo - Handali	27
Handali - Kitemo	29
Mkonze - Chidilo - Nondwa	52
Chidilo - Chipanga - Chali - Ikasi	34
Chali - Chikopero - Chipanga	29
Mpunguzi - Mwitikira - Mpwayungu	40
Trunk Road - Hombolo - Meia Meia	52
Trunk Road - Msanga - Chilonwa - Dabalo - Itiso	98
Chenene - Itiso - Izava	79
Total District Roads	481 km

* This road is less than the 6 km minimum described in Section VI, but is included because of its importance as a connector to a Trunk Road.

c. Feeder Roads

Ntyuka - Chololo	27
Trunk Road - Ihumwa - Kikombo	22
Nghahelezi - Igandu	10
Nondwa - Chifutuka	20
Chifutuka - Huzi	15
Huzi - Chinungulu	29
Mpwayungu - Huzi - Ilangali	60
Nghome - Mwitikira	30
Mlowa Barbarani - Idifu	20
Makatapora - Chihanga - Gawaye	28
Hombolo Dam - Mkoyo - Kawawa	16
Hombolo - Zepisa	10
Ipala - Chahwa - Vikonje	14
Nala - Zuzu	10
Zuzu - Mbabala	20
Nala - Mbalawala	10
Mbalawala - Ilindi	24
Mbalawala - Mundemu - Mzakwe	20
Mundemu - Lamaiti	30
Lamaiti - Mkakatika - Bahi	40
Chigongwe - Kigwe - Ngulugano - Chipanga	36
Kigwe - Mpinga - Ngulugano	17
Trunk Road - Msanga	13
Chilonwa - Chinangali - Majeleko	8
Dabalo - Manyembe	20
Itiso - Zajilwa	15
Itiso - Haneti	33
Haneti - Humekwa	19
Total Feeder Roads	616 km

3. Kondoa District

a. Local Main Roads

Meia Meia - Babayu - Kwamtoro	68
Bicha - Dalai - Tandala - Kolo	84
Bicha - Kondoa	3*
Total Local Main Roads	155 km

* This road is less than the 6 km minimum described in Section VI, but is included because of its importance as a connector to a Trunk Road.

b. District Roads

Araa - Chandama - Mrijo Chino	48
Jangalo - Tandala	21
Mnenya - Kisese - Kikore	50
Kondoa - Kwamtoro	56
Kwamtoro - Kinyamsindo	48
Kwadinu - Thawi	24
Total District Roads	247 km

c. Feeder Roads

Chemba - Goima	16
Chandama - Jangalo	12
Pahi - Bumbuta - Chubi	37
Chubi - Arusha Region Boundary	16
Bumbuta - Chungai	12
Kisaki - Kisese	16
Gubali - Mwisanga	27
Total Feeder Roads	136 km

B. Singida Region

1. Singida District

Present Classifications/Descriptions	Length (km)
a. Local Main Roads	None
b. District Roads	
Singida - Ilongero - Mtinko	40
Ilongero - Merya - Mdilu	21
Singida - Sepuka	22
Mangonyi - Ikungi	24
Ikungi - Dungunyi	10
Dungunyi - Mungaa	13
Mungaa - Makiungu - Kititimo	14
Kititimo - Mgori	11
Ntuntu - Mungaa	19
Ihanja - Mtongo	22
Total District Roads	196 km
c. Feeder Roads	
Mtinko - Mudida	11
Sepuka - Mahenge	35
Singida - Ihanja	29
Londoni - Mangonyi	29
Mungaa - Misughaa - Kinyamsindo	39
Misughaa - Ntuntu	11
Total Feeder Roads	154 km

2. Iramba District

a. Local Main Road

Misigiri - New Kiomboi	24

b. District Roads

Iguguno - Kinyangiri - Mkalama	80
Sepuka Songambele - Kisaga	54
New Kiomboi - Kinakumi	8
Kitusha - Kinakumi - Tulya	68
Ulemo - Msingi - Gumanga	40
Total District Roads	250 km

c. Feeder Roads

Ndguti - Iambi - Nkungi	35
Ndguti - Nkalankala - Munguli	53
Nkalankala - Mwanga - Kidarafa	28
Songambele - Urughu - Kibigiri	56
Tulya - Doromoni	6
Total Feeder Roads	183 km

3. Manyoni District

a. Local Main Roads None

b. District Roads

Manyoni - Aghondi - Itigi	40
Manyoni - Heka	42
Total District Roads	82 km

c. Feeder Roads

Aghondi - Muhanga - Ipande - Mbugani	49
Itigi - Chaya	43
Itigi - Damwalu	10
Manyoni - Mjiri	16
Heka - Sasilo	24
Heka - Nkonko	25
Nkonko - Ntumbi	19
Nkonko - Majiri	79
Majiri - Chikuyu	40
Majiri - Kinangali - Makasuku	12
Makasuku - Itetma	11
Makasuku - Kilamatirde - Solyo	27
Trunk Road - Kintinku - Kitalolo	8
Kintinku - Makanda	32
Chikuyu - Makutupora	11
Chikuyu - Mbwasa	8
Solyo - Saranda - Hika - Londoni	72
Total Feeder Roads	486 km

C. Kilimanjaro Region

1. Same District

Present Classification/Description	Length (km)
a. Local Main Roads	
Makanya - Mwembe	38
Mkanyeni - Vudee	8
Same - Mwembe - Manka - Msindo - Bomba - Mamba	104
Ndungu - Mamba	13
Total Local Main Roads	163 km
b. District Roads	
Makanya/Mwembe Road - Chome	19
Makanya - Kombo - Meferejini	71
Meferejini - Same	26
Kisiwari - Msindo	16
Mpirani - Bomba	12
Mpirani - Kadando	9
Maore - Makongoanzeghe	21
Hedaru - Vunta	24
Total District Roads	198 km
c. Feeder Roads	None

2. Mwanga District

a. Local Main Roads	
Kisangara - Nyumba Ya Mungu Dam	17
Mwanga - Kikweni	11
Kikweni - Usangi	14
Kikweni - Kifula - Mangio - Uchama	18
Campi Ya Simba - Uchama	7
Muvraini - Usangi	6
Mwanga - Kagongo	20
Total Local Main Roads	93 km
b. District Roads	
Kibisini - Mangio	10
Butu - Kifula	7
Kwakoa - Toloha	15
Kisangara - Upper Kisangara	15
Kisangara - Chanjali - Chonvu	30
Lembeni - Kirya	20
Lembeni - Kilomeni	15
Mgagau - Ndea	15
Total District Roads	127 km

c. Feeder Roads

Kifaru - Campi Ya Simba - Butu - Kwakoa - Mgagau	80
Kifaru - Campi Ya Simba Road - Kibisini	7
Chonvu - Usangi	15
Total Feeder Roads	102 km

4. Material Availability

a. Introduction

Sources of materials for road construction, rehabilitation and maintenance are generally available throughout the project districts. Gravel sources include alluvial gravels and sands, residual gravels and lateritic or concretionary gravel and ironstone. Most roads have some pits if the subgrade has been stabilized mechanically with gravel or granular material. If gravel or granular material has not been used to stabilize the entire surface, many roads have short sections which have been surfaced to attain year-round trafficability.

Residual gravel mixed with residual soil is a common source where the parent rock contains resistant minerals such as quartz which becomes concentrated as the rock weathers. Such quartz-rich residual deposits are common throughout the project districts overlying the granite, granite-gneiss, and other acid-gneisses that are the predominant rock types. These gravels usually retain the color and texture of the original rock. Particles are generally angular to sub-rounded and range in size from sand to boulders, with intermediate pebbles and cobbles. The particles are often stained red by iron oxide. The volume of gravel depends on the depth of weathering, which in turn is a function of several factors including rainfall, terrain, vegetation and degree of jointing. Widely spaced joints and fractures do not lead to deep weathering. The large granitic monoliths common in Dodoma and Singida Regions are monuments of resistance to weathering and erosion.

Concretionary ironstone is common within the Acrisols and Luvisols of Dodoma and Singida Regions. The concretions and hardpans have formed as horizons in these soils, particularly where the rainfall is greater than 600 mm per year. The gravel consists of spherical nodules or concretions of iron oxide or hydroxide approximately 1.5 mm in diameter embedded in matrix of sand and silt with some clay. The nodules vary in hardness from friable to very hard, requiring a hammer to break. The concretions rarely constitute the entire coarse fraction in Dodoma and Sinda Regions; usually there is an admixture of quartz pebbles which may predominate in some pits.

Indurated ironstone (laterite) horizons are also common in Dodoma and Singida Regions. These vary in thickness but generally are rarely thicker than one meter; hardness varies from workable with hand tools to non-rippable. Variations in quality and thickness are common within short lateral and vertical distances.

Most of the concretionary gravels and ironstone being utilized are of inferior quality. Picks and shovels are the means generally employed for excavation. The result is that the hard materials such as indurated ironstone and large boulders are wasted and the poorer materials selected.

Mbuga soils, clays and clayey silts (the Vertisols) often contain nodules of calcium carbonate. These deposits have been utilized in other regions and found to be adequate for surfacing material where other materials are lacking. The clay binder is highly plastic and if the percentage of clay becomes excessive, the stability of the material is low during rains.

Stream gravels are also utilized but to a lesser extent than the concretionary materials and residual quartz gravels. Most of these are found in drainageways in areas with appreciable relief. Gradations vary widely and large boulders have to be wasted in small operations involving only hand labor. Concretionary gravels and residual quartz gravels are preferred for unpaved roads because they have a higher content of fines which function as binder.

Other sources of materials are calcareous crusts, siliceous crusts, talus and alluvial fans. Calcareous crusts are fairly widespread, particularly in areas with under 500 mm of rain annually. These deposits, also termed calcrete or caliche, remain potential sources although they are often quite thin. Siliceous crusts or silcrete less common. Talus and alluvial fans are possible sources in areas with great relief such as the Pare Mountains and parts of Mpwapwa, Kondoa and Iramba Districts, although no pits were observed in such deposits.

b. Quality of Materials

The rehabilitation projects will involve shaping of roadbeds and providing for drainage for all project roads selected. About

half of these roads will also have embankment material and surfacing gravel or granular materials added. If only shaping and drainage is scheduled, the surfacing will be the natural subgrade. In many parts of Dodoma and Singida Regions, the subgrade soils are essentially granular. Sections through depressions may be filled with unsatisfactory material and require some cover to maintain trafficability. The subgrade soils in the Pare Mountains are less satisfactory. However, Vertisols do not occur in the mountains and many of the soils in the surrounding lowlands are granular.

The deterioration of unpaved roads results from the loss of surface material; formation of corrugations and potholes; softening of the surface during rain; and the loss of fines to dust during the dry season. It would be impossible to design an unpaved road that required no maintenance. A correlation of the performance of unpaved roads to the maintenance required rather than to a thickness-CBR relationship would probably be more appropriate.

However, it has been observed that the difficulty in maintaining untreated gravel roads was related to the subgrade soil and the thickness of select material above the subgrade. This indicates that a structural thickness requirement is appropriate in designing unpaved roads. Some minimum thicknesses for various subgrade values are shown in Table VII-12, which were modified from Lyon Associates study (1975)[1/] for the design of unpaved roads. A minimum CBR value of 50 for the select material, or surfacing, was recommended.

TABLE VII - 12

Equivalent Pavement Designs

Design	Surface Thickness cm	Subgrade CBR
1	25	10
2	20	20
3	10	40

1/ Lyon Associates, Inc., 1975. Laterite and Lateritic Soils and other Problem Soils of the Tropics: An engineering evaluation and highway design study for U.S. Agency for International Development, Contract AID/CSD 3682.

A more relaxed thickness requirement for earth or aggregate surfaced roads has been proposed by the Waterways Experiment Station (U.S. Corps of Engineers) who have been active in developing criteria for earth and aggregate surfaced roads for various purposes. Their criteria for adequate surface strength is given in the nomograph in Figure VII-9. For a tire pressure of 50 psi and a 10 Kip single wheel load, a subgrade with a CBR of 15 will sustain 10,000 coverages. Thickness criteria for an aggregate surface layer is provided by the equation: 1/

Log thickness = -1.02165 log load + 0.63624 log tire pressure + 0.2148 log load + 0.2394 log coverages -0.4028 log subgrade CBR - 0.3140 log cover CBR.

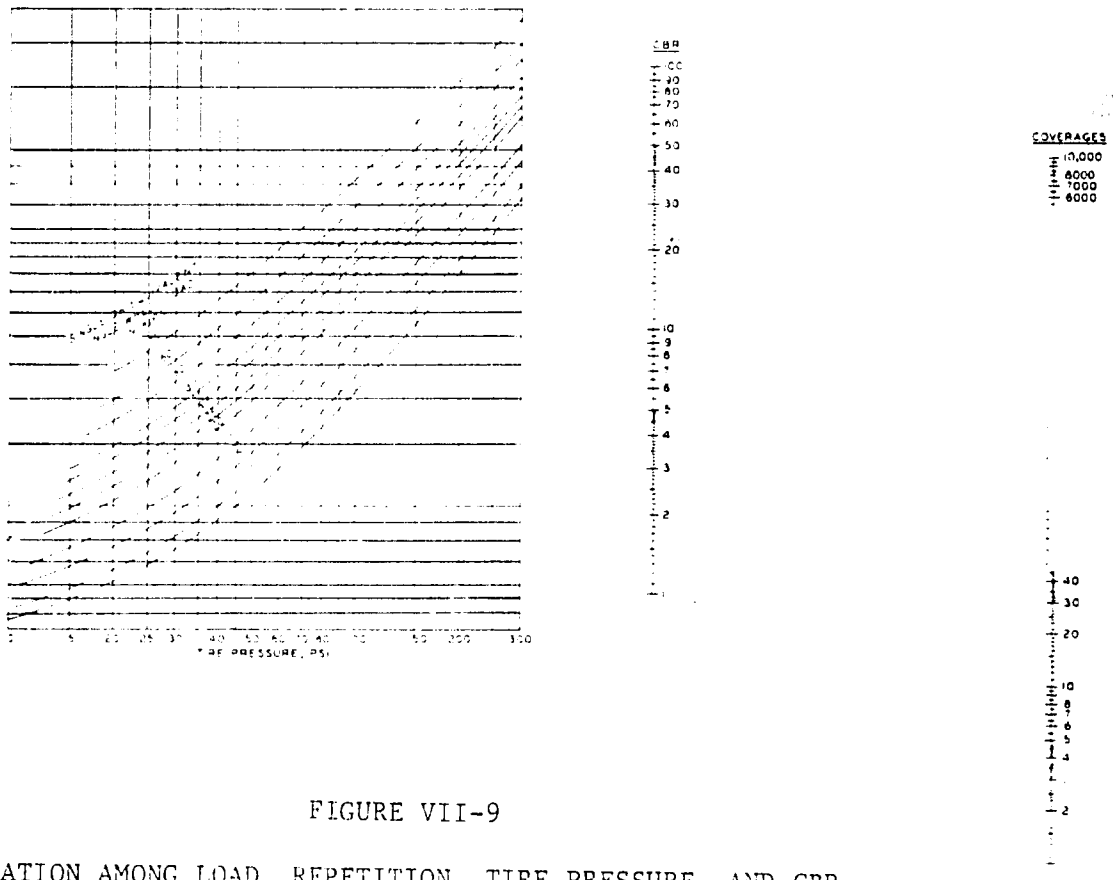


FIGURE VII-9

RELATION AMONG LOAD, REPETITION, TIRE PRESSURE, AND CBR FOR UNSURFACED SOILS. 1/

1/ Ahlvin, R.G. and Hammitt, G.M. II, 1975: Load-supporting capability of low-volume roads, Trans. Res. Bd. Spec. Rep. 160.

Surfacing material should be granular and of reasonably good quality. The material should contain sufficient fines to act as binder. Too much binder produces unstable surfaces and too little binder produces loose surfaces prone to the formation of corrugations. Maximum aggregate size should be 19 mm.

A recommended gradation for surface aggregate is as follows:[1/]

U.S. Sieve Size	Percentage Passing
19mm (3/4 in.)	100
9.5mm (3/8 in.)	80 - 100
5mm (No. 4)	55 - 85
2mm (No. 10)	35 - 65
0.425mm (No. 40)	20 - 40
0.074mm (No. 200)	15 - 30

Other suggested limits:

Maximum value of Liquid Limit times the percentage passing the No. 200 sieve = 1600.

Maximum value of Plasticity Index times the percentage passing the No. 200 sieve = 800.

Similar suggested gradations based on British Standard sieve size are as follows:[2/]

BS. sieve size	Percentage passing		
	Nominal maximum size		
	19mm(3/4 in)	9.5mm(3/8 in)	4.75mm(3/16 in)
19mm (3/4 in)	100	—	—
9.5mm(3/8 in)	80-100	100	—
4.75mm (3/16 in)	60-85	80-100	100
2.36mm (No. 7)	45-70	50-80	80-100
425mm (No. 36)	25-45	25-45	30-60
75mm (No. 200)	10-25	10-25	10-25

Climate	Liquid limit not to exceed (%)*	Plasticity index range (%)*	Linear[2] shrinkage (%)**
Moist temperature and wet tropical	35	4-9	2-4
Seasonal wet tropical	40	6-15	3-7
Arid	55	15-30	7-14

*There are some soils that possess a structure which is not easily broken down by traffic, e.g. some lateritic and concretinary soils. With these, higher limits may be acceptable. There are other soils with a structure that is broken down by traffic. Thus any variations from the limits should be based only on carefully collated local experience.

**The linear shrinkage test has the advantage of requiring only very equipment.

Satisfactory quality gravel sources are available along almost all roads selected for rehabilitation and will be located and examined by the rehabilitation teams. General suitability will be determined by experienced personnel through simple field tests although some laboratory assistance may be required.

Processing pit deposits is expected to be kept to a minimum. Oversize material may be screened and excessive fines may be wasted, but elaborate screening and crushing operations will not be necessary.

c. Dodoma and Singida Regions

(1) Geology. Precambrian granite, granodiorite and granite-gneiss are the predominant rocks in the western half of Dodoma Region and most of Singida Region. Small areas of Dodoma System rocks, mainly amphibolite, schist, and quartzite are included within the granitic rocks of Dodoma Region and in the southern part of Singida Region. Rocks of the Usagaran System occupy the eastern half of Dodoma Region which are mainly composed of meta-sediments, various schists and gneisses with some marble. Small areas of meta-sediments, schists and some banded ironstone of the Nyanzian System occur within the granite in northern Sigida Region. Quaternary

1/ Lyon Associates, 1975, op.cit.

2/ Odier, L.; Millard, R.S.; dos Santos, Pimentel; Mehra, S.R., 1971, Low cos roads: design, construction and maintenance, Butterworth, London.

continental sediments are found in the basins and low-lying areas in the central and southern regions. Lacustrine clays are located in the Bahi depression between Dodoma and Manyoni.

(2) Soils. Most of the soils formed over the granites are deep loamy sands. Sandy loams have developed in the eastern part of Dodoma Region and in central and northern Singida Region. Clay loams have formed in the northeast and southeast in Dodoma Region. These have been grouped together as ferric acrisols in the FAO Soils Map. Deep dark gray clays (Vertisols) occur in the Bahi depression.

(3) Materials. Concretionary and indurated ironstone horizons are common throughout most of Singida Region and the southwestern part of Dodoma Region. Calcareous crusts are also common in the northeastern part of Singida and much of eastern Dodoma. Other possible sources of materials include silcrete, some talus deposits and some alluvial fans and stream gravels.

Satisfactory sources of aggregate are commonly available within short distances of existing roads. Sources include concretionary ironstone and residual quartz gravel deposits formed over the granite and gneisses; surface limestone or calcareous crusts; and stream gravels.

d. Kilimanjaro Region, Same and Mwanga Districts

(1) Geology. Precambrian gneisses and granulites outcrop in the two southern districts of Kilimanjaro Region. These are the principal rock types that occur in the Pare Mountains. Recent and Pleistocene lacustrine sand, silt and limestone occur in a narrow strip in the west.

(2) Soils. Sandy loams have developed in the Pare Mountains and to the west of the mountains. Loams, silty loams and clayey loams have formed to the east of the mountains. Black clays or clayey silts are common in topographic depressions on both sides of the mountains. All of these soils have been grouped together as Nitosols under the FAO Soils Map.

(3) Materials.

Concretionary ironstone does not occur in the Mwanga and Same Districts as it is not a constituent of Nitosols. Alluvial gravel does occur, but it is not widespread. The most important source of roadway material are deposits of weathered residual soil with resistant minerals that make up the coarse fraction. The most common is quartz gravel. Calcareous duricrust occurs in most of the surrounding lowlands. Alluvial gravels have been located west of the mountains. There are several roads in each district for which material sources have not been found.

E. Rehabilitation Program

1. General

As a result of the long neglect suffered by the roads being considered within this program, considerable effort will be required to reconstruct them to an acceptable all-weather standard. Under ideal circumstances, i.e., availability of sufficient funds, trained manpower, equipment, and facilities, an organization would be established in each District to rehabilitate and maintain the roads for which they are responsible, and to perform betterments and/or new construction on a "funds and time available" basis.

Within the constraints of funds and trained personnel, as they exist today in Tanzania, it is not possible to achieve this desirable number of units, and the efforts of the teams which can be organized must be spread beyond any one District boundary.

Generally speaking, for the most effective management and supervision of maintenance and rehabilitation operations, the Maintenance District should be limited to between 500 and 1000 km of roads. This limitation would justify approximately 8 maintenance units.

By limiting the activity of the maintenance units to routine, periodic, rehabilitation and preventative maintenance activities, thus omitting betterment and new construction work, it appears feasible to extend the responsibility for the Maintenance District to between 1,000 and 2,000 km in which case four maintenance units would be required and which could be located as follows:

Region	Approximate Length of Local Main, District, and Feeder Roads (km)	No. of Maintenance Teams	Tentative Vicinity
Dodoma	3,829	2	Chenene, Handali
Singida	2,253	1	Ikungi
Same/Mwanga*	1,013	1	Same
TOTAL	7,095 km	4	

*Since a large percentage of the roads in this Region are hilly to mountainous, it is reasonable to accept fewer total kilometers of roads. Mountainous roads require more effort than those in the other Regions where the terrain is essentially flat to rolling and hilly.

The general production to be expected from each Rehabilitation Unit (described later in this report) of the Maintenance Team is estimated as follows: (production of earth work in Same/Mwanga Districts at 60% of the other two Regions)

Clearing and Shaping Unit: 400 km/year

Embankment and Surfacing Unit: 240 km/year

New Culvert and Drift Unit: 1,440 meters/year

Bridge Construction Unit: As necessary

With the expected production above, the project would accomplish the following:

Location	Number of Rehabiliation Teams	Clearing and Shaping (km)	Surfacing	New Culvert and Drift (m)
Dodoma Region	2	800	480	2,880
Singida Region	1	400	240	1,440
Same/Mwanga Districts	1	240	140	1,440
PER YEAR		1,440 km	860 km	5,760 m
3 - YEAR PROGRAM		4,336 km	2,580 km	17,280 m

a. Availability of Local Contractors

For all intents and purposes there are no active road construction contractors qualified for highway work in the project regions. The few local contractors who are working in Tanzania are not equipped for roadwork per se, but concentrate on building construction and urban infrastructure projects such as urban sites, roads and services projects. At the present time, the private road contractors work is generally limited to trucking and stockpiling gravels because they do not possess the additional equipment needed to form a complete fleet capable of highway construction.

It is suggested that the capability that the local contractors possess as trucking contractors be utilized in other rehabilitation and new construction projects. The road rehabilitation program proposed below should be performed completely in-house by the teams described.

b. Construction Techniques

Labor intensive construction and rehabilitation is practical when:

(1) labor is plentiful within short distances of the construction site;

(2) terrain is favorable, i.e., level or rolling;

(3) quantities of excavation are relatively small and can be managed by hand tools; and

(4) distances for materials are short. Transporting embankment and surfacing materials long distances and compaction and reshaping the roadway involving large volumes of excavation are tasks more suited to equipment.

Labor is generally available in all project districts, but there are long sections of roads where population is sparse and transporting the work force would be required. The I.L.O. program proposed for Dodoma, for example, estimates an average of 660 mandays per kilometer. This translates into a serious logistics problem for transport and supplies.

A further aspect of labor-intensive construction is that supervision is extremely important. Unskilled laborers must be instructed and closely supervised. Various studies have shown that good supervision results in far greater production. Poor supervision results not only in low production but also in inferior or unacceptable work. The intermediate supervisors required for such work are in very short supply in Tanzania. The present inadequate level of maintenance is largely due to the shortage of such trained supervisors. Expatriate assistance would be necessary and the large numbers required would be costly.

Costs of labor-intensive construction are high, U.S. $10,000 per kilometer or more. It has been argued that such expenditures involve little foreign currency whereas equipment purchases involve considerable foreign currency. Also, employment of the labor force usually has positive social benefits. However, in the proposed program, foreign currency would be required for funding; there would be no "loss" of foreign currency for

implementation. The most cost-effective is clearly a mix of labor and equipment.

Recent studies by the World Bank and the International Labor Organization (ILO) conclude that the optimum construction technique for highway work in developing countries involves the use of intermediate technology, including labor intensive methods and fully mechanized processes, devoting to machines the tasks for which they are particularly efficient. Rehabilitation tasks involving large volumes of earth movement are more efficiently and economically performed by machines.

The proposed organization incorporates the intermediate technology concept. The rehabilitation and maintenance program proposed consists of both labor and equipment intensive methods, employing the most practical and appropriate work method for each task. All work within the program which can be effectively accomplished by labor intensive methods includes: ditch and culvert cleaning; vegetation control; minor surface maintenance; rubble and mortar waterways; headwalls and abutments; etc. Earth moving equipment which is included and discussed later (Figure VII-14) includes one grader, one loader and one dump truck for each clearing and shaping unit. This is a modest amount of equipment indeed but it is essential to accomplish the work anticipated.

2. Organization

The present organization of the Ministry of Works is given in Figure VII-10. The responsibility for the Trunk Roads Maintenance Program, which is not shown, presumably remains under the Road Maintenance Senior Engineer. A line of communication exists between the Chief Engineer of the Roads and Aerodromes Division and the Regional Engineer. This is shown in Figure VII-11, where the line of authority from Regional Development Director to the Regional Engineer is also shown. The District Engineer is under the authority of the District Development Director and maintains a line of communication with the Regional Engineer.

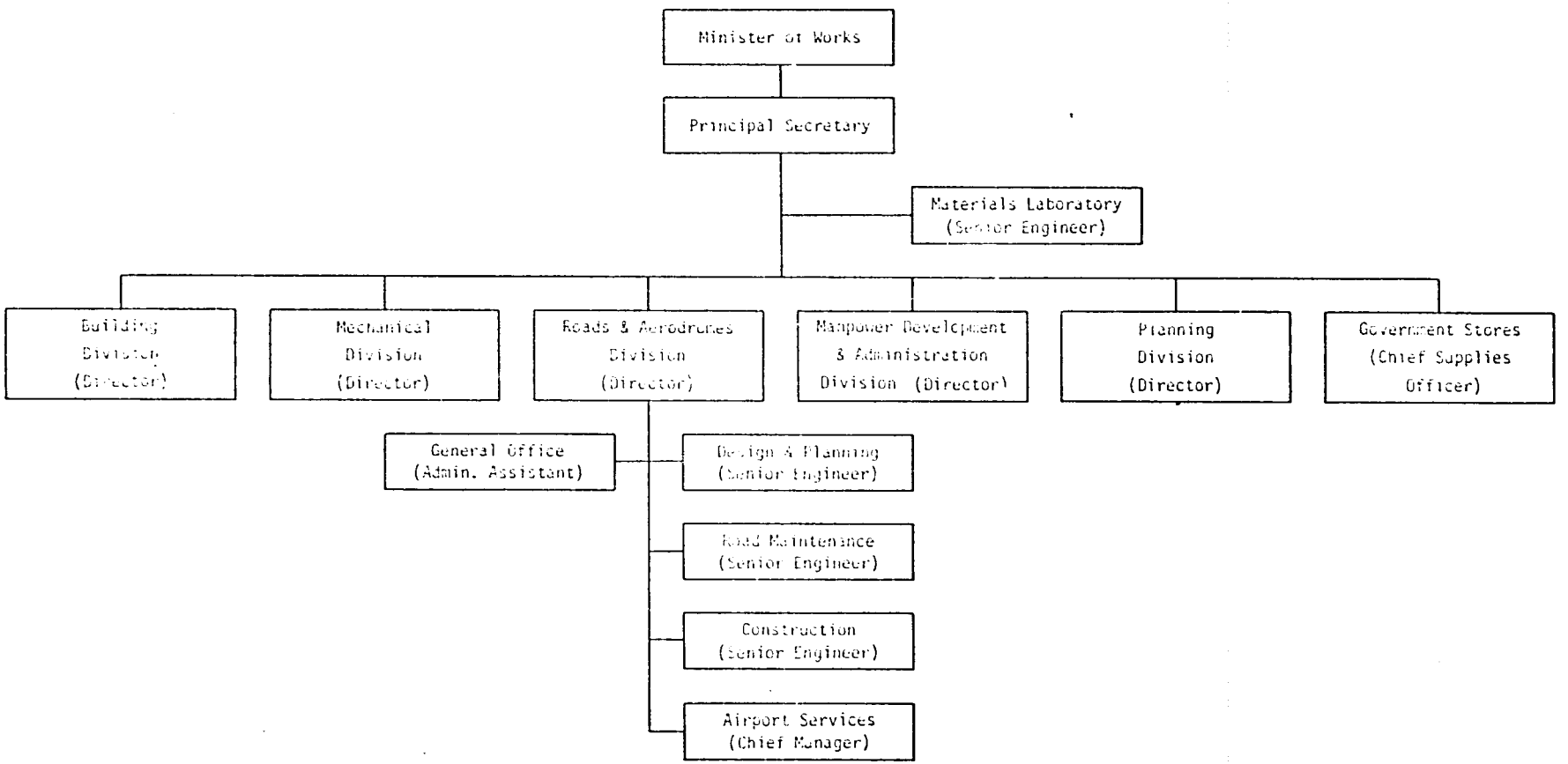


FIGURE VII-10

ORGANIZATION CHART, MINISTRY OF WORKS

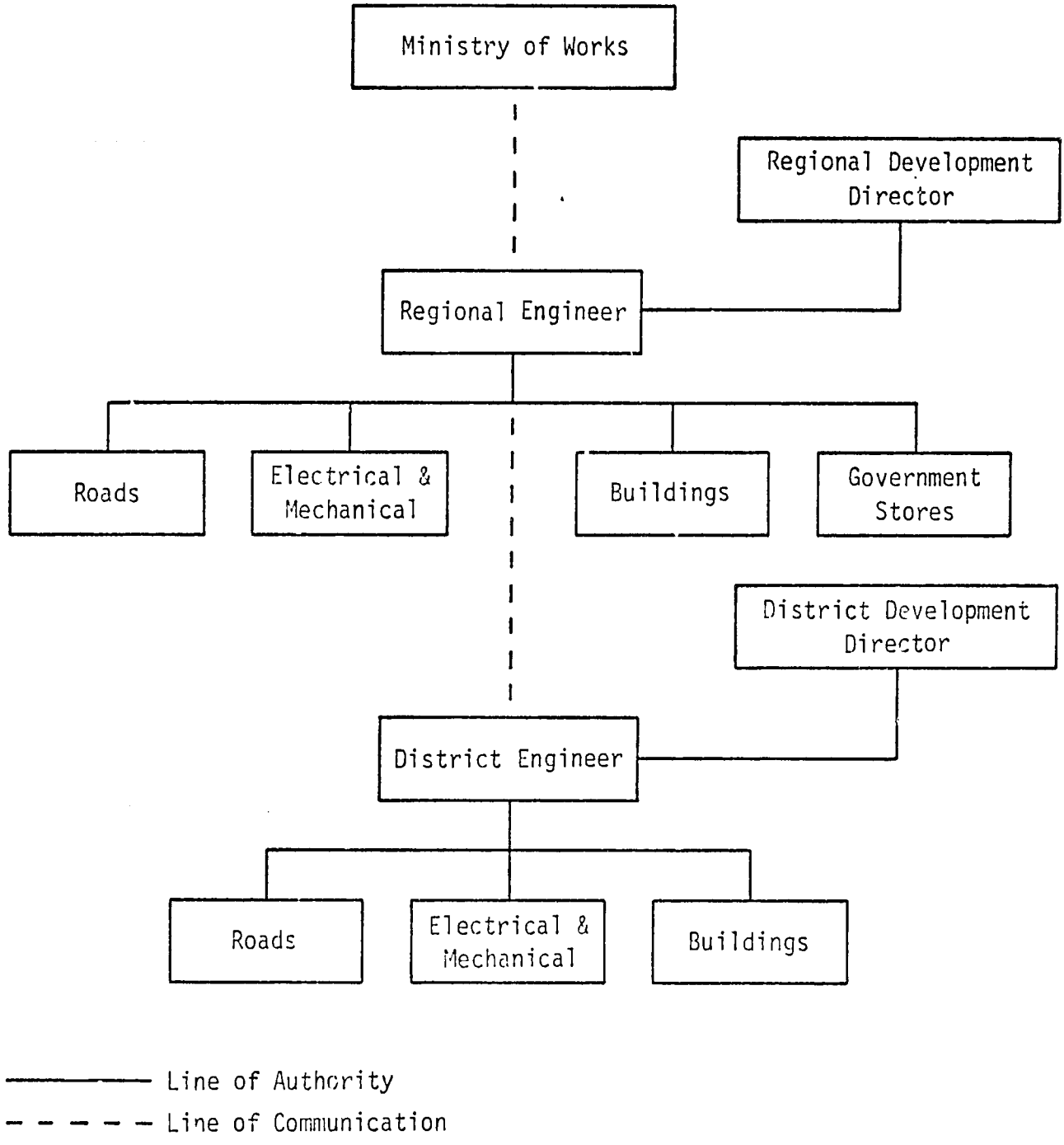


FIGURE VII-11

ORGANIZATION CHART, REGIONAL ENGINEER AND DISTRICT ENGINEER

This organization is not functioning and the condition of the roads attests to this fact. The Regional Engineer and the District Engineer have responsibilities other than roads which results in inadequate time and resources being spent on roads. In situations where resources are already too thin, those in authority are forced to divert these resources to areas of greater need. This will be the inevitable result unless funds are greatly increased, which is an unlikely possibility. Highway Departments that are under the control of local political leaders usually experience the same diversion of resources.

The administrative structure of Tanzania is organized to give as much local autonomy as possible to regions and, within regions, to districts. Decentralization was undertaken as a governmental policy in the 1970s and has been encouraged so long as local prerogatives do not oppose national policies. In practice, this policy creates something of a paradox as to where authority is located. In the capital, officials in national offices tend to be unwilling or unable to speak about specific deployment of development efforts within regions and districts, since each of these has its own local priorities. Within districts, however, where development projects must actually be carried out, it is often the case that those responsible for implementing projects find themselves without necessary funds, equipment, and personnel and dependent upon higher authorities in regional or national offices for the needed support. Thus, the present structure neither allows central planning not gives enough independence to local districts over supplies and personnel. The specific consequence is often inaction in local development projects.

To circumvent this problem as much as possible, it is recommended that the construction phase of the project be managed independently of the offices of the RDDs in the three regions. Only by removing the project during the initial intensive construction phase as fully as possible can it be largely ensured that bureaucratic problems inherent in the current administrative structure are minimized. Since the RDD must oversee all development projects within his region and continually make what seem to him to be the best decisions regarding all development programs, removing the road construction project from

his immediate control will eliminate the difficult decisions he often has to make as scarce resources are deployed and development priorities change. In addition, this will allow more central control during the construction phase. Careful monitoring of the project is necessary to see that it is properly implemented. It is expected that RDDs and DDDs will become more involved in the maintenance phase. However, by that time, local personnel will have been trained and the project will be in place so fully that it will be more difficult to shift resources needed for road maintenance from the purpose intented by the donor.

The following organization chart, Figure VII-12, presents the proposed Project Coordination Team and the Regions and Districts included in the program being considered. Figure VII-13 presents the general organization of the Rehabilitation Teams while Figure VII-14 depicts in more detail the equipment and manpower required for each of the operating units of the Rehabilitation Teams. The equipment is limited and included for those tasks that are not efficiently or economically performed by hand labor. Essentially these tasks involve large volumes of earth movement in reshaping the roadways; loading and transporting fill and surfacing materials; and water trucks and compaction equipment to achieve suitable roadway densities.

The function of the Project Coordination Team is contemplated to be the overall supervision; to organize and supervise training programs; technical support; liaison; and guidance to the Field Rehabilitation Teams. The Project Coordinator is expected to maintain a close working relationship with the Regional Engineers and other Regional and Governmental agencies to assure a harmonious association to allow the project to proceed with maximum efficiency and a minimum of outside obstacles to meet project goals.

The function of the Rehabilitation Team is to accomplish the rehabilitation of the selected roads, or segments of roads, in accordance with the schedule, guidelines and standards previously determined. The Highway Engineer/Training Supervisor/Field Team Leader is expected to maintain close liaison with the District Engineer(s) and other District Government officials to assist the Rehabilitation Teams to accomplish the preset goals in an orderly manner.

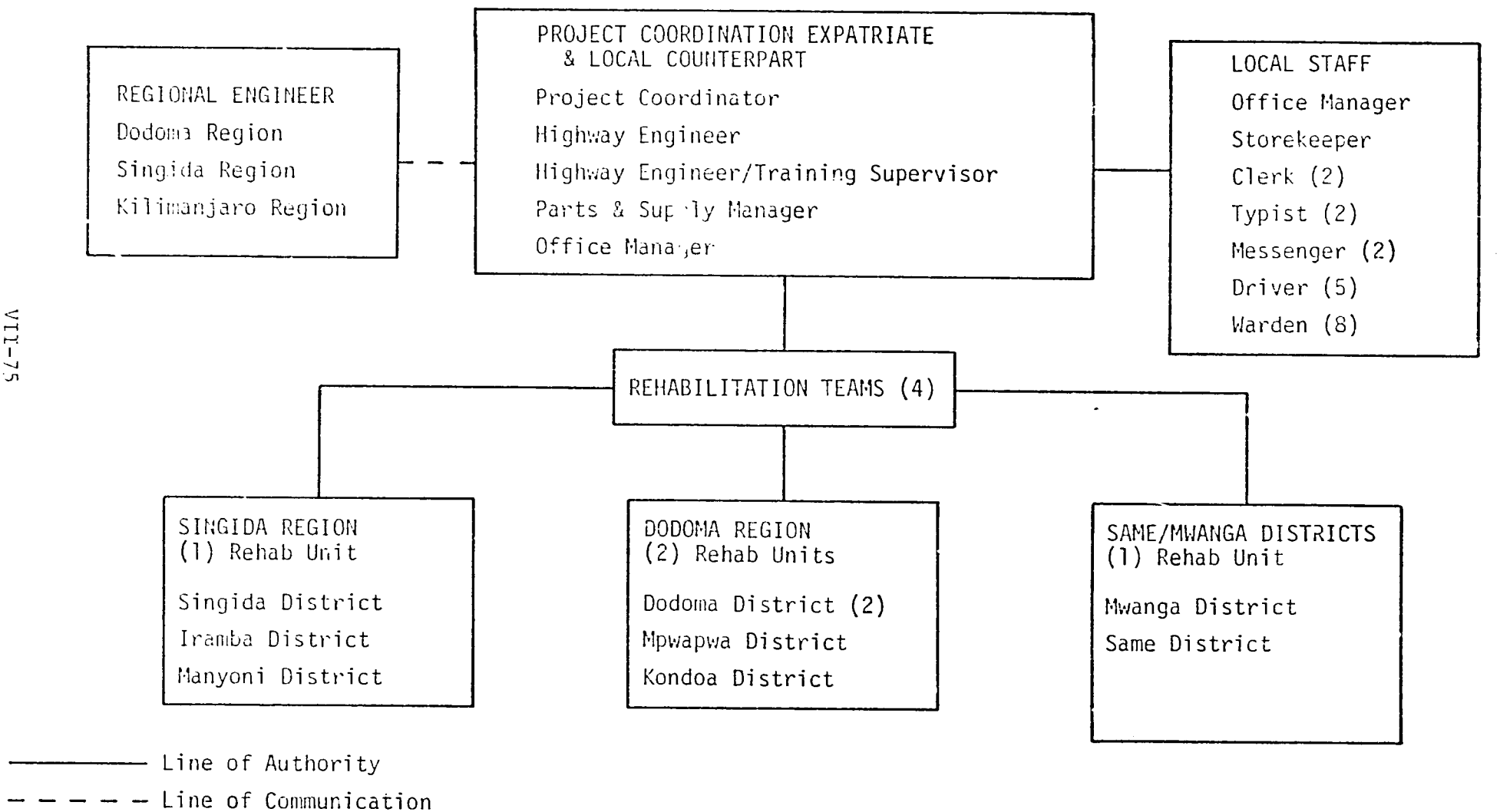


FIGURE VII-12

PROPOSED RURAL ROADS REHABILITATION ORGANIZATION

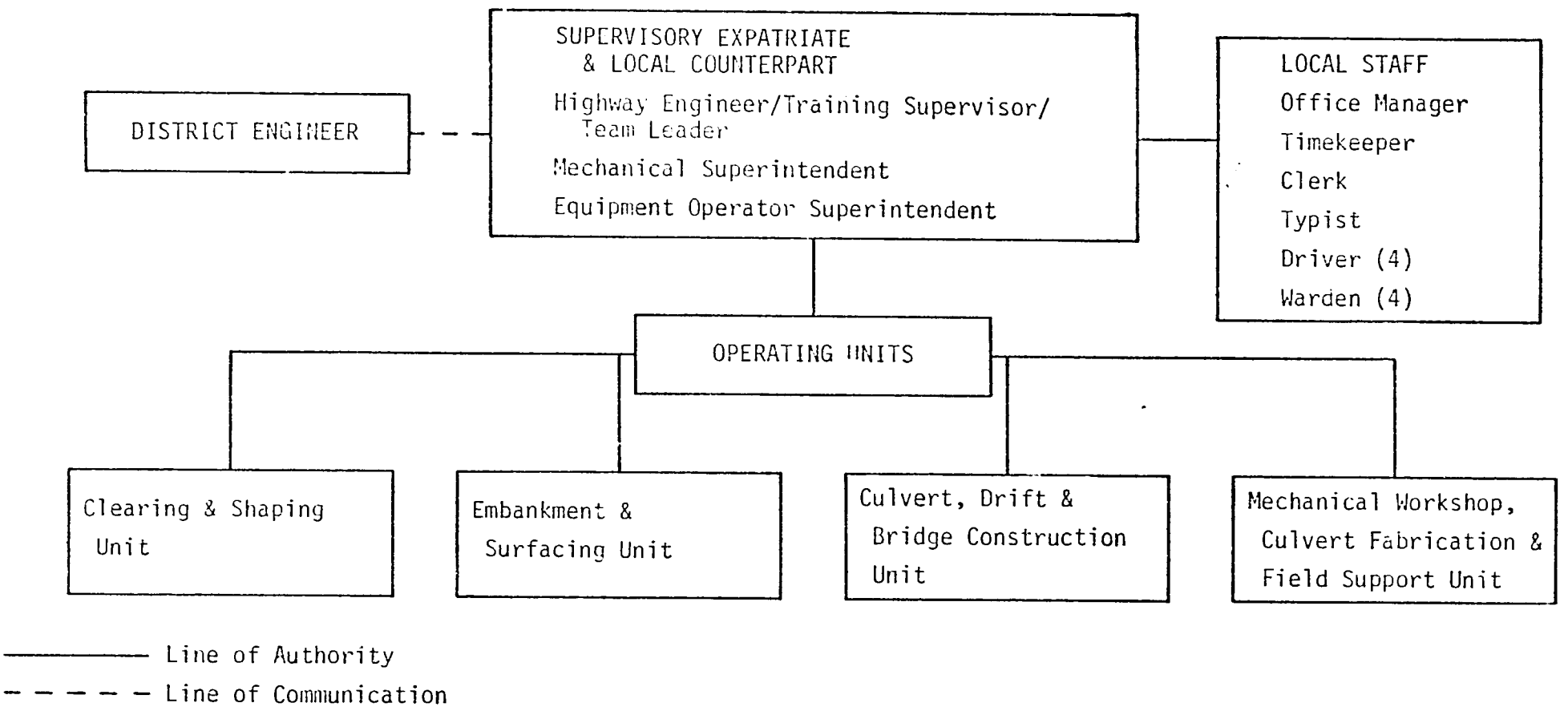
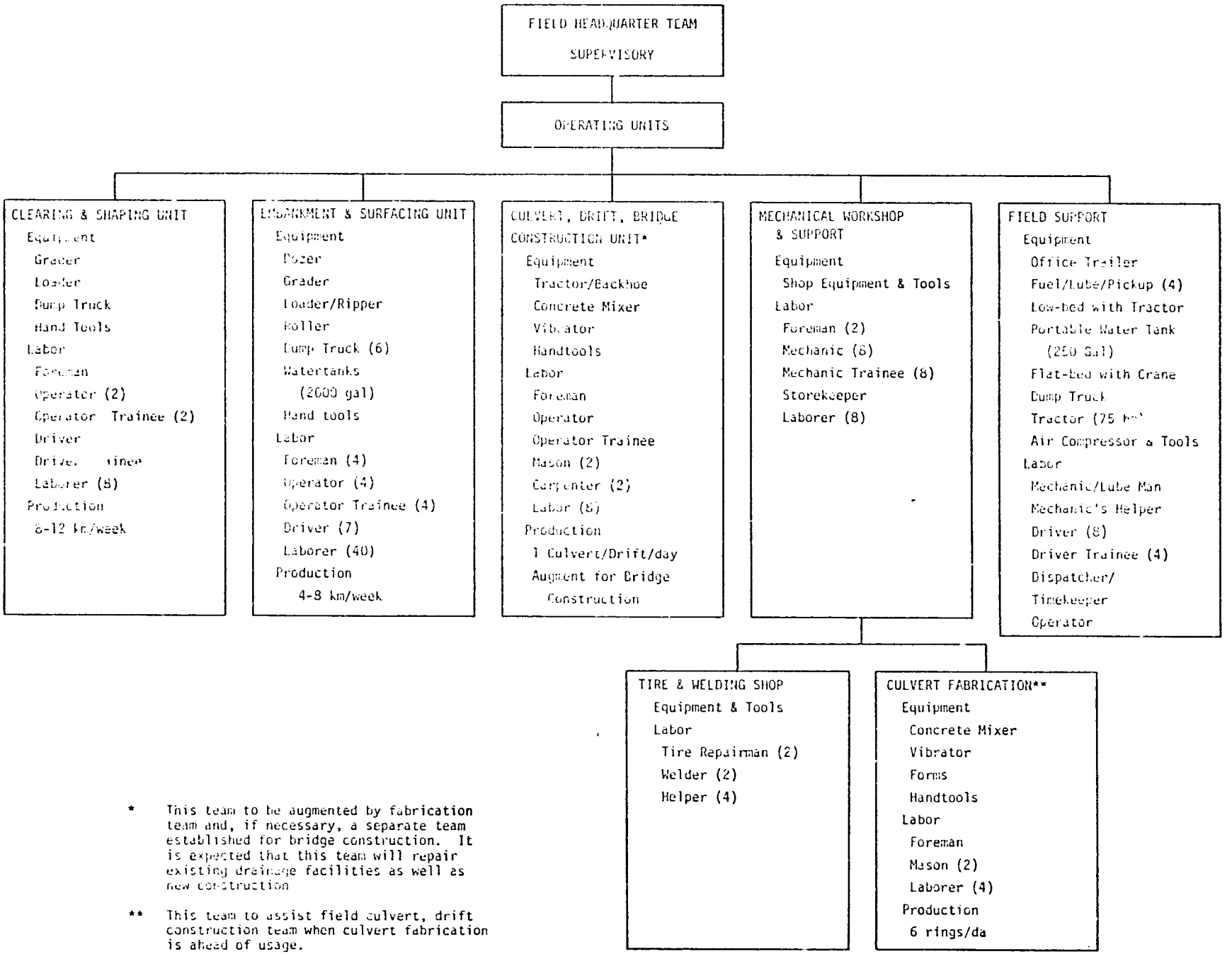


FIGURE VII-13

TYPICAL REHABILITATION FIELD TEAM



* This team to be augmented by fabrication team and, if necessary, a separate team established for bridge construction. It is expected that this team will repair existing drainage facilities as well as new construction

** This team to assist field culvert, drift construction team when culvert fabrication is ahead of usage.

FIGURE VII-14

FIELD TEAM

Experience indicates that approximately one year will be required between the placing of firm orders for the equipment and its arrival on the job site in Tanzania. Six months prior to the arrival of the equipment, the Project Coordination Team should be on-site to set up the Project Organization. Selection of qualified local candidates for the various staff, counterpart, and operating positions; providing for the assembly and servicing of the enroute equipment upon arrival and movement to the job-site; erection of the shop buildings, quarters and other facilities; and the preparation of operational and accounting documentation is expected to be accomplished during the lead time.

During this same period, all roads to be rehabilitated under the program shall be traveled by the Expatriate Highway Engineers, together with their counterparts, to establish the construction requirements including drainage and guidelines for each road being considered. This is important as no detailed designs will be prepared for these roads. Field judgements will be made by the inspecting teams to meet the most cost-effective solutions for the rehabilitation of each road being considered.

Shortly before the arrival of the equipment to Tanzania, the Mechanical Superintendent and the Equipment Operation Superintendent, together with their respective counterparts, should be on-site to select qualified mechanics and operators from a pre-prepared list of candidates, and to supervise the assembly, servicing and movement of the equipment to the projects. It should be a pre-condition that the mechanical shops be operational before the newly received equipment is expected to be put to work on the project to assure proper maintenance, servicing, and repairs from the beginning of the actual roadwork.

The organization as herein described must have full control of the equipment, facilities, and manpower of the project. Their efforts must not be diluted by extra project tasks or subject to the loss of equipment facilities or manpower to perform work outside of the agreed project

The following is a description of the expected activities of the several component units of the Rehabilitation Field Team.

a. Rehabilitation Field Teams

Figure VII-14 presents the anticipated composition of the various operating units of the rehabilitation team. The production rates expected from the various units have been established after a review of recent studies and projects in the general vicinity of the proposed program and an analysis of the capability of the proposed team units. 1/ 2/ 3/ A 40 week/year work schedule has been used to allow for rains,holidays and unexpected lost-production days.

The duties of these units are essentially as follows:

(1) Clearing and Shaping Unit

The activities of this Unit are limited to vegetation clearing and reforming the existing travelways with readily available materials from the roadway and ditches. They shall cut and shape the roadside ditches, using the excavated material of acceptable quality from the ditches as part of the backfill required in the formation of the travelway. They shall also remove and dispose of unsatisfactory materials, such as unsuitable "black cotton" soils and backfill these areas with satisfactory imported roadside or short haul borrow. It is not expected that the Clearing and Shaping Unit will repair or replace extensive areas of eroded roadway or embankment, or excavate and replace with acceptable borrow materials extensive areas of swamp. The areas to be repaired by the Unit will be limited to the ability of the Unit to accomplish and still maintain the expected schedule of daily or weekly kilometers of completed clearing and shaping.

It is expected that this Unit will be active on almost all the roads included in the Project and should be able to cover approximately 400 km of roads per team per year at an average rate of 10 km per week.

1/ The Rehabilitation of Rural Roads in Handeni District (Tanzania) (1978) TIRDEP
2/ Dodoma Region, Secondary Roads Study, United Nations, 1979.
3/ Discussion with personnel for the ARVPD project in Arusha.

(2) The Embankment and Surfacing Unit

This Unit will follow the Clearing and Shaping Unit and rehabilitate the road by importing borrow material as necessary to provide an acceptable all weather travelway that is properly crowned, compacted and finished to the pre-determined standard. Erosion damage to embankments and travelways will be repaired and these areas of undesirable materials not within the capability of the Shaping Unit to correct will be removed and replaced with suitable borrow. Field observations made during the reconaissance trips indicate that, in many cases, roadside borrow is available; in other areas an average haul distance of about 5 km can be expected. Compaction of newly placed or shaped embankment and/or surfacing materials will be accomplished by the compaction equipment, with water added by the water truck to obtain the optimum moisture content. In some extreme cases, final compaction may have to be left for traffic compaction when water is not available. This is not a desirable condition, although it may have to be accepted in some extreme cases. Every effort should be made to assure proper compaction during construction.

Areas of bridge scour will be corrected by replacing the scoured materials to permit scour protection measures to be taken. In those areas where channel changes will reduce the scour effect, such channel changes as are within the unit capability will be made.

The anticipated production of the Embankment and Surfacing Unit is expected to average about 6 km per team per week or 240 km per year.

(3) The Culvert, Drift, and bridge Construction and Repair Unit

The activities of the Unit will be scheduled concurrently with the Embankment and Surfacing Unit and repair or replace damaged culverts and headwalls, install new culverts where necessary and repair existing drifts and bridges where required. The construction or repair of scour protection, paved waterways,

etc., and other erosion control facilities shall also be accomplished by the Unit.

The anticipated production of this Unit can be expected to be approximately 36-40 meters of new culvert, or paved waterway per week per team, or 1,440 meters per year, plus repair of existing facilities.

Since the production of the Culvert Fabrication Unit (described next) can be expected to exceed the daily or weekly requirement of the Placing Unit, this Unit will augment the Placing Unit as necessary on tasks such as bridge repair, scour protection, erosion control, etc. In the event corrugated metal pipe (CMP) culvert sections are used on the project, in lieu of locally fabricated concrete pipe, the Fabrication Unit would then be employed in the field as a Placing, Repair and Construction Unit. New bridge and drift construction may be accomplished by specially mobilized teams, depending upon the volume of work involved (number and complexity of the new structures.) An estimated cost for the new structures which would be required is included in the overall project cost to provide for this extra activity.

(4) Mechanical Workshop and Support Units

The mechanical workshop is responsible for the repair and maintenance of all project equipment and vehicles, and to assure that an adequate supply of fuel, lubricating oils and spare parts are on hand to insure that the proper maintenance and repair is performed in a timely manner. Preventative maintenance measures will be instituted to prevent undesirable down time for the production fleet to assure the maximum possible production per unit.

The Tire and Welding Shops and other subsidiary shops are contained in the Mechanical Workshop as natural components of that facility.

The Field Support Units shall be controlled by the Mechanical Workshop. The Support Units are those units of the plant which

are required by the field operating units on an intermittent basis only and are dispatched by the Mechanical Workshop as necessary.

The Culvert Fabrication Unit is under the control of the workshop for its daily operations support, i.e., for casting of concrete culverts, supply of water, gravel and other supplies as well as lifting and hauling equipment for completed concrete culvert sections as needed.

Since it is expected that the production of this Unit will exceed that of the field Units to place the fabricated culverts, the Fabrication Unit will augment the Field Units from time to time or in cases when the additional men and equipment are required for particular tasks.

Locally manufactured concrete culvert pipe are included in the present program. If corrugated metal pipe (CMP) culvert replaces the concrete culvert, then the Fabrication Units will join the Field Units on a full time basis.

b. Expatriate Personnel

The duties of the Expatriate Personnel will be as follows:

(1) Project Coordinator

The duties of this individual will include Team Leadership. He is primarily responsible for the activities of all the people on the project. He shall exercise final judgement on the quality and quantity of work performed. He will be the sole liaison between the Team, USAID, the Regional Engineers, and the Government of Tanzania for administrative and program performance. He will represent the contract and will authorize any changes in any aspect of the work program.

He will make personnel evaluations of all contract persons, and continually monitor all trainee performances. He will assure that proper training is being provided and that all Tanzanian personnel are profiting from the training and instruction. It will be a primary aim of the contract to permit the counterparts

to exercise their increasing responsibility and the project coordinator will make every effort to expound this idea.

It will also be his responsibility to monitor the project and assure that proper project records are kept and maintained, including cost accounts.

(2) Chief Highway Engineer/Deputy Project Coordinator

He will serve as Deputy to the Project Coordinator and will assume those duties during the absence of the Project Coordinator.

He will advise on any deviation from the agreed construction standards and will exercise final authority. He will be the Technical Advisor for the field operations. He must have strong management abilities and be able to make decisions regarding all aspects of road work. He will be required to travel and make frequent inspection trips to all areas.

He must have a strong background in bridge and culvert construction and have a working knowledge of bridge, hydraulic, and drainage design. He is expected to provide guidance and technical assistance to the Field Teams.

He will prepare regular quarterly reports, or as required by the Project Coordinator, on the progress regarding rehabilitation, maintenance and construction efforts.

(3) Highway Engineer/Training Supervisor

The Highway Engineer should have a strong soils and material background and should be familiar with tropical soils and materials. He will be required to make judgements regarding all types of materials used in road construction, their uses and limitations and recognize when laboratory assistance is required.

He should have experience in highway construction technology in developing countries by labor intensive methods as well as the combination of labor intensive and equipment construction.

One of his major responsibilities will be to organize, prepare and monitor the training program. He will be instrumental in selecting both the trained workers and the trainees. He will develop training programs including collecting and distributing training materials and evaluation criteria such as operator

certifications. He will insure that these are consistently applied among the four rehabilitation teams.

Much of the training material will be collected from publications and training programs that are available in the United States such as the Corps of Engineers and the Forest Service. The Highway Engineer/Training Supervisor will collect these materials before leaving for Tanzania. This will include material for all counterpart engineers and superintendents as well as the operators, mechanics, and other skilled workers.

He will prepare a training schedule for each team. He will submit quarterly reports to the Project Coordinator on the training program and trainee progress.

He will also provide technical assistance to the Field Teams as needed.

(4) Parts and Stores Manager

He will be responsible for all parts and stores. He will supervise set up, and maintain a reliable system of inventory and use records which include fuel, oil, lubrication, repair costs, labor, parts and supplies used in the program.

He will set up and maintain an inventory and locator system for parts and supplies to assure that a minimum stock is on hand at all times and that all stock is properly documented and costed.

(5) Office Manager

He is responsible for personnel records and management on the contract, to include time keeping records and all project fiscal and other accounts.

He must set up methods to record all costs related to road supervisory, construction, and maintenance. These records must reflect an on-going cost during the operation and must finally give absolute costs per km of road to include labor, materials, equipment operational costs, equipment maintenance costs, and all other related costs.

He will assist the Highway Engineers/Training Supervisors/ Team Leaders in maintaining complete records on all counterparts

personnel and trainees. He will maintain personnel records for the Project Coordinator.

(6) Highway Engineer/Training Supervisor/Team Leader

He will coordinate all activities in his area of field operations and his area of responsibility. He will make frequent inspection trips to all working groups and record progress and resolve any problems that may arise. He will coordinate his activities with the Regional Engineer and District Engineers and work harmoniously with those offices.

Since this is a field design job, he must make field judgements on design standards and assure they adhere to the design and construction criteria regarding performance and cost. He shall consult with the proper engineer for design assistance when necessary and accompany him on site inspections.

He will prepare a rehabilitation schedule for his area of responsibility with the assistance of the Project Coordination Team and prepare quarterly reports concerning rehabilitation progress.

He will be the supervisor of all training in his team and see that the agreed training schedules are followed and regular evaluations and ratings made. It will be his responsibility that each trainee is rated fairly and his progress recorded.

(7) Mechanic Supervisor/Instructor

He will direct and control all maintenance, repair and replacement work in the district shop. He will oversee and train all personnel in their job activities and rate trainees on a regular basis for the Team Leader.

He will, as an important part of his duties, set up and maintain an accurate and cost effective Parts Department. He will introduce and encourage current records keeping ideas for labor, spare parts, and all supplies.

(8) Equipment Operating Supervisor/Trainer

He will make sure that all operators fulfill the necessary operator maintenance schedules.

He will make determinations regarding operator capability. He will as a part of his duties assign trainees to the various operators for instructional purposes. He will also monitor progress and make changes as necessary. He will rate trainees on a regular basis for the Team Leader. He will assure that equipment is properly cared for and operated, and that proper use records are maintained for the equipment being employed on the project. He will see that all work is performed in an efficient and cost effective manner.

3. Training

Training will be an essential aspect of the Rehabilitation Program. The number and type of counterparts and trainees for each team is given in Figure VII-13. Counterpart supervisory and administrative personnel for these teams is also given in Table VII-14, which also shows the counterpart requirements for the subsequent Maintenance Program. The Maintenance Program is discussed in Section VIII. The existing manpower in the regional and district shops is given in Table VII-15.

It has been repeatedly stated that one of the major obstacles to an effective highway organization is the lack of qualified and experienced staff. This is believed to be due in large part to management. There is no shortage of skilled labor, although the level of skill for many of these listed might be questioned. The properly trained and skilled workers are overwhelmed in work shops by poor organization, lack of parts and equipment and few incentives to produce.

Sub-professional and professional staff is a more serious shortcoming in that the available supply is small indeed. Sub-professionals, or technicians, are promoted to higher positions because no qualified engineers are available. This situation is expected to continue for several more years.

The training program proposed is described in detail in Volume II. It is based entirely on on-the-job training for skilled workers, technicians, administrators and engineers. The trainees and counterpart personnel would be selected after arrival of the expatriate teams. It is believed that ample numbers of sufficiently skilled personnel are available to form the nucleus of the rehabilitation teams, or that can become sufficiently skilled during the initial mobilization period. Technicians, and particularly

TABLE VII-13

LOCAL PERSONNEL REQUIREMENTS
FOR REHABILITATION PROGRAM

PERSONNEL	PROJECT COORD.	DODOMA REGION (TWO TEAMS)	SINGIDA REGION (ONE TEAM)	SAME/MWANGA (ONE TEAM)	TOTAL
Senior Highway Engineer	2				2
Highway Engineer/ Training Supervisor	1	2	1	1	5
Chief Admin. (Office Manager)	1				1
Admin. (Office Mgr. or Chief Storekeeper	1	2	1	1	5
Storekeeper	1	2	1	1	5
Timekeeper		2	1	1	4
Dispatcher		2	1	1	4
Clerk	2	2	1	1	6
Typist					
Messenger	2				2
Driver	5	40	20	20	85
Driver Trainee		24	12	12	48
Warden	8	8	4	4	24
Foreman		18	9	9	36
Operator		16	8	8	32
Operator Trainee		16	8	8	32
Mason		8	4	4	16
Carpenter		4	2	2	8
Mechanic		16	8	8	32
Mechanical Trainee		18	9	9	36
Tire Repairman		4	2	2	8
Tire Repair Trainee		4	2	2	8
Welder		4	2	2	8
Welder Trainee		4	2	2	8
Mech./Lube Man		2	1	1	4
Total Local Personnel Required		136	68	68	272

TABLE VII-14

COUNTERPART REQUIREMENTS FOR

REHABILITATION AND MAINTENANCE PROGRAM

a. Rehabilitation

Project Coordination

Expatriate	Local Counterpart	No. Required
Project Coordinator	Senior Engineer	1 each
Chief Highway Engineer	Senior Engineer	1 each
Highway Engineer/ Training Supervisor	Highway Engineer	1 each
Office Manager	Chief Administrator	1 each
Parts/Stores Manager	Administrator	1 each

Field Rehabilitation Team

Highway Engineer/ Team Leader	Highway Engineer	4 each
Mechanical Supt.	Mechanical Superintendent	4 each
Equipment Operation Superintendent	Chief Operator	4 each

b. Maintenance

Expatriate	Local Counterpart	No. Required
Project Coordinator	Senior Engineer	1 each
Chief Engineer/ Training Supervisor	Senior Engineer	1 each
Office Manager	Chief Administrator	1 each

Field Maintenance Team

Highway Engineer/ Team Leader	Highway Maintenance Eng.	4 each
Mechanical Superintendent	Mechanical Superintendent	4 each
Equipment Operation Superintendent	Chief Operator	4 each

TABLE VII-15

EXISTING MANPOWER

	DODOMA REGION	DODOMA URBAN	DODOMA RURAL	KONDOA	MPWAPWA	SINGIDA REGION	SINGIDA RURAL	MANYONI	IRAMBA	KILIMANJARO	MWANGA	SAME
ENGINEER	1	1	1	1	1	1	1	1	1	1	1	1
ROAD TECHNICIAN	2		2	1	1		1	1		1	1	1
ROAD FOREMEN	3	1	1	1	1		1	1	1		2	1
OPERATOR	14		6	6	4		7	7	4		2	2
DRIVERS	30		11	6	5		16	8	5		4	5
MECHANIC	53		16	15	11		57	14	5		7	14
CARPENTER	6		2	4	3		6	2	2		4	4
MASON	6		2	4	3		5	2	2		4	4
BLACKSMITH	4		0	2	3		2	2	2		0	0
STOREKEEPERS	12		2	4	4		6	4	2		4	4
OFFICE PERSONS	14		2	5	4		10	12	4		5	6
BLASTERS											1	1

There are some differences in Regions where part of the work force is assigned to the Trunk Road Maintenance Program.

graduate engineers, may be more difficult to locate. Some qualified technicians may be promoted to engineering positions to fill some of the counterpart positions.

The initial screening and selection of candidates will be extremely important and will involve considerable cooperation between the Project Coordination Team and the Regional officials as well as between the Field Rehabilitation Teams and the District officials. The preliminary evaluation and training of the individuals selected will also be important. It is believed that with cooperation, all the initial positions can be filled, although in some cases, transfers from other regions may be required.

For higher level positions, the project will rely on the training of Tanzanian counterparts. Efforts will be made to ensure the availability of good housing and social services as well as such important supports for their families as arable land for gardening, schools for their children, etc. In addition, every effort will be made to keep wages competitive with parallel positions in the public and private sector in other parts of Tanzania. Thus, as much as is possible will be undertaken to ensure that those who are trained to assume positions of responsibility at the end of the three-year training period will stay in place after the departure of the expatriates.

For non-professional jobs in the subprofessional and operational categories, similar efforts will be made to ensure a high level of monetary compensation for work and to provide good opportunities so that the jobs remain attractive to incumbents.

In addition to doing all that seems possible to ensure stability of personnel, additional efforts will be made to expand as widely as possible the group of potential job candidates. During the three-year training period, all training and maintenance manuals will be translated into Swahili by members of the team. Thus, literacy in English will not be a necessary requirement for occupying one of the subprofessional or operational jobs. This will maximize the pool of persons who might be interested in such jobs over the long run since most tanzanians receive only a few years of formal schooling and very little, if any, English language instruction.

4. Schedule

The roads selected for clearing and shaping, as well as those selected for additional embankment construction and gravel surfacing have been summarized in Table VII-10 and listed individually in Table VII-11. The locations of these road segments are shown on Plates VII-1 through VII-8.

The Rehabilitation Team for the Southern Maintenance District of Dodoma Region will rehabilitate 498 km of Mpwapwa District, then 465 km of Dodoma District. A final 165 km of rehabilitation will then be completed in both districts. The Rehabilitation Team for the Northern Maintenance District of Dodoma Region will first rehabilitate 120 km of Dodoma District before moving to Kondoa District to rehabilitate 339 km. They will return to Dodoma district to complete 492 km and then return again to Kondoa to complete the final 199 km.

The Singida Rehabilitation Team will complete 201 km in Iramba District first, followed by 129 km in Singida District. They will return to Iramba to complete 256 km before moving to Manyoni where they will rehabilitate 568 km. Finally, they will return to Singida District for the final 221 km.

The Kilimanjaro Rehabilitation Team will first complete 227 km in Mwanga District before moving to Same District, where they will complete the entire 361 km to be rehabilitated in that District. They will then return to Mwanga District to complete the final 95 km.

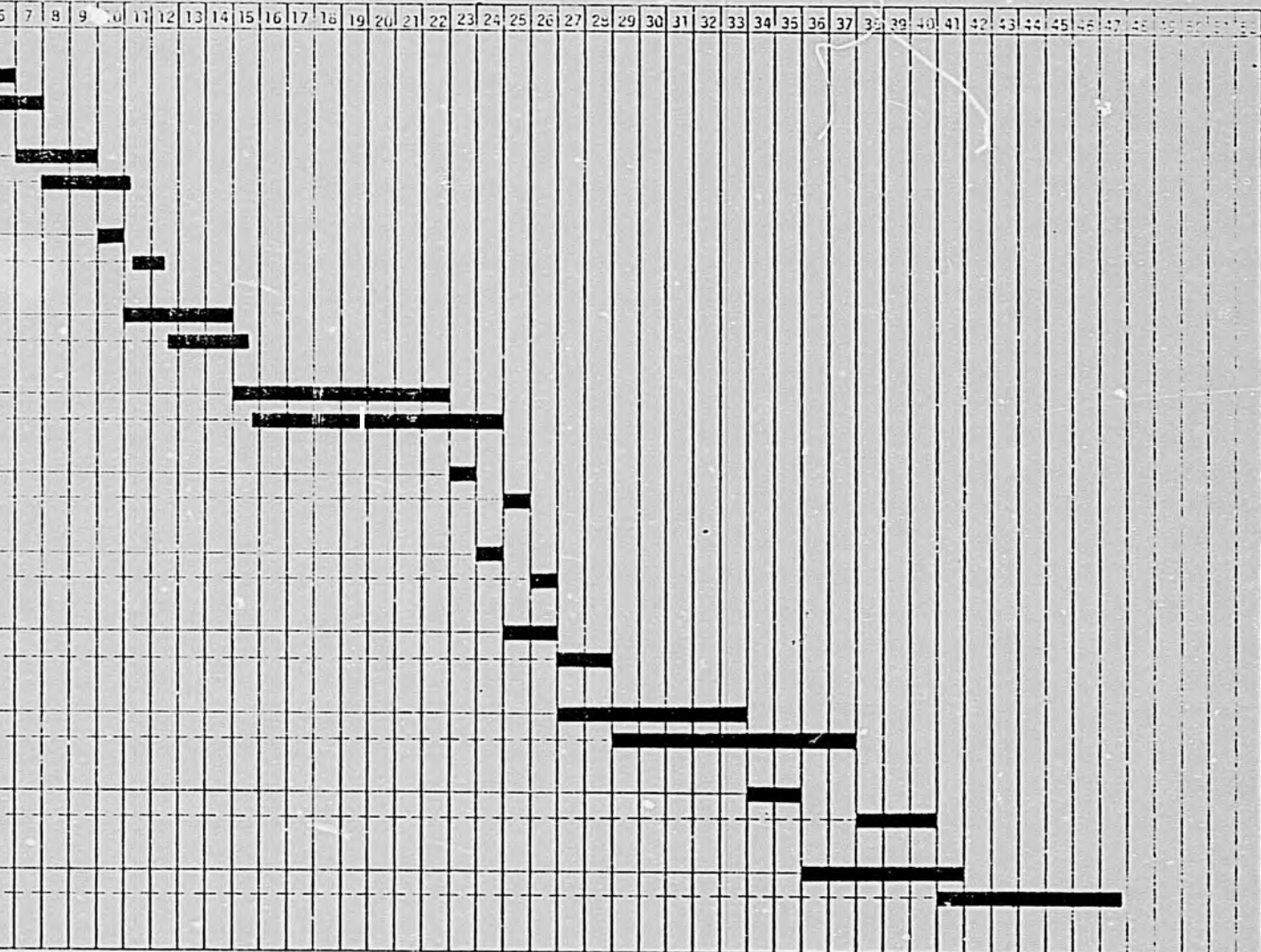
The following construction schedules are based on the production rates described in Section VII E.1, that is 400 km/yr. clearing and shaping and 240 km/yr. of embankment and surfacing. These are considered to be reasonable rates of work for reasonably efficient organizations that are not subject to diversionary requests. It is important that these units retain sufficient independence that they will not be subjected to interference with this program and these schedules.

DODOMA REGION
SOUTHERN MAINTENANCE TEAM
FIRST YEAR

REHABILITATION WORK PROGRAM

Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Trunk Road-Dotosa	63		
1		63	
2			35
Mlali-Pandambili	24		
1		24	
2			20
Trunk Road-Kongwa	3		
1		3	
2			3
Kongwa-Suguta	40		
1		40	
2			20
Ngheribi-Mpwapwa-Mlali	81		
1		81	
2			60
Trunk Road-Vilundilo	10		
1		10	
2			5
Chunyu-Mtagali	10		
1		10	
2			5
Mpwapwa-Gulwe	15		
1		15	
2			10
Gulwe-Pudi	74		
1		74	
2			55
Kibakwe-Kwana Wota	23		
1		23	
2			15
Gulwe-Futu	64		
1		64	
2			45
TOTAL:	407		273



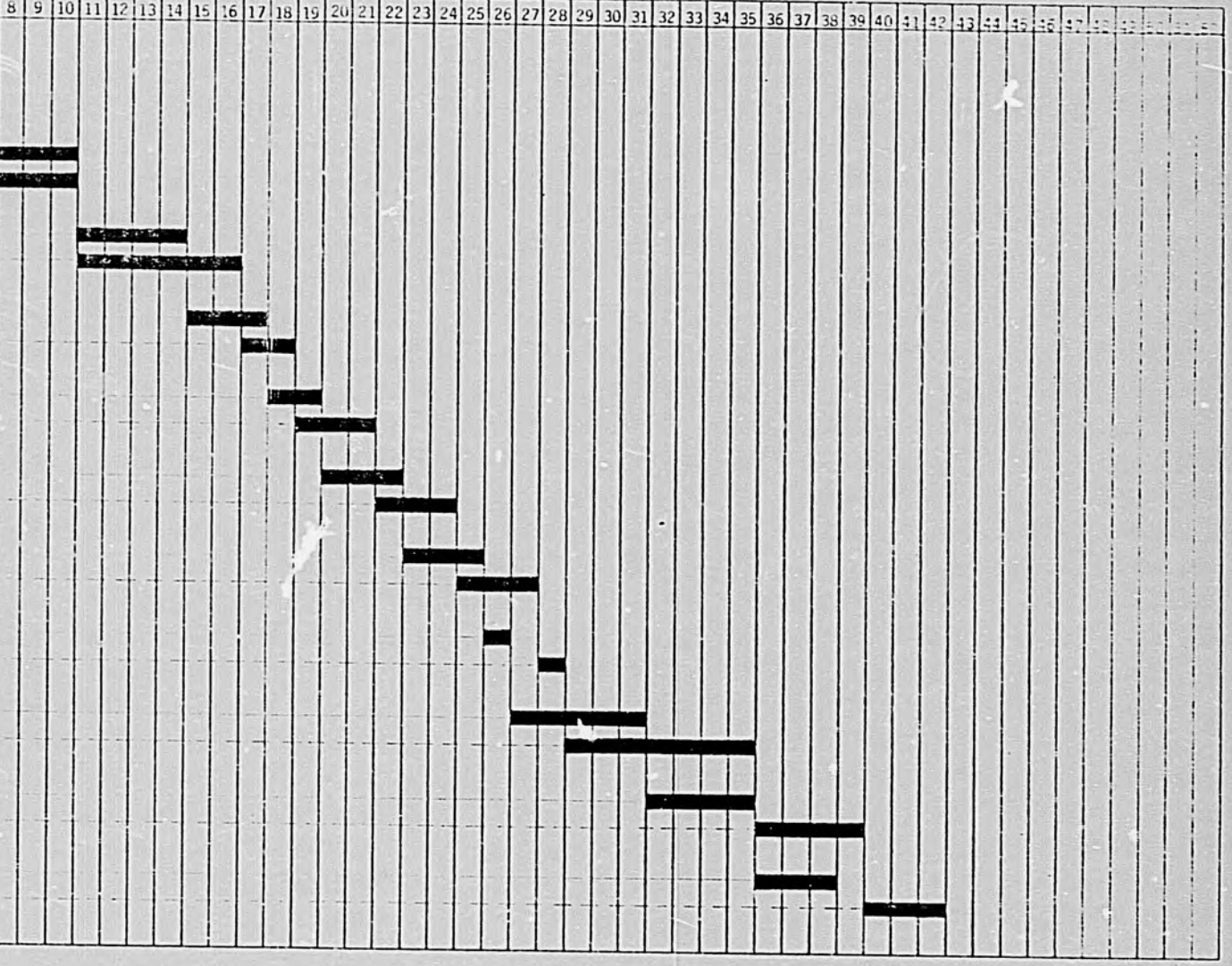
Work Item
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

REHABILITATION WORK PROGRAM

DODOMA REGION
SOUTHERN MAINTENANCE TEAM
SECOND YEAR

Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Matarondo-Godegode	16		
1		16	
2			12
Godegode-Mbuga	75		
1		75	
2			45
Dodoma-Mvumi-Nkulabi	41		
1		41	
2			35
Ntyuka-Chalolo	27		
1		27	
2			15
Trunk Road-Ihumwa-Kikombo	22		
1		22	
2			15
Trunk Road-Kikombo-Handali	27		
1		27	
2			20
Handali-Kitemo	29		
1		29	
2			20
Kwamtelezi-Igandu	10		
1		10	
2			5
Mkonze-Chidilo-Nondwa	52		
1		52	
2			40
Chidilo-Chipanga-Chali-Ikasi	34		
1		34	
2			25
Chali-Chikapero-Chipanga	29		
1		29	
2			25
TOTAL:	362		257



Work Item

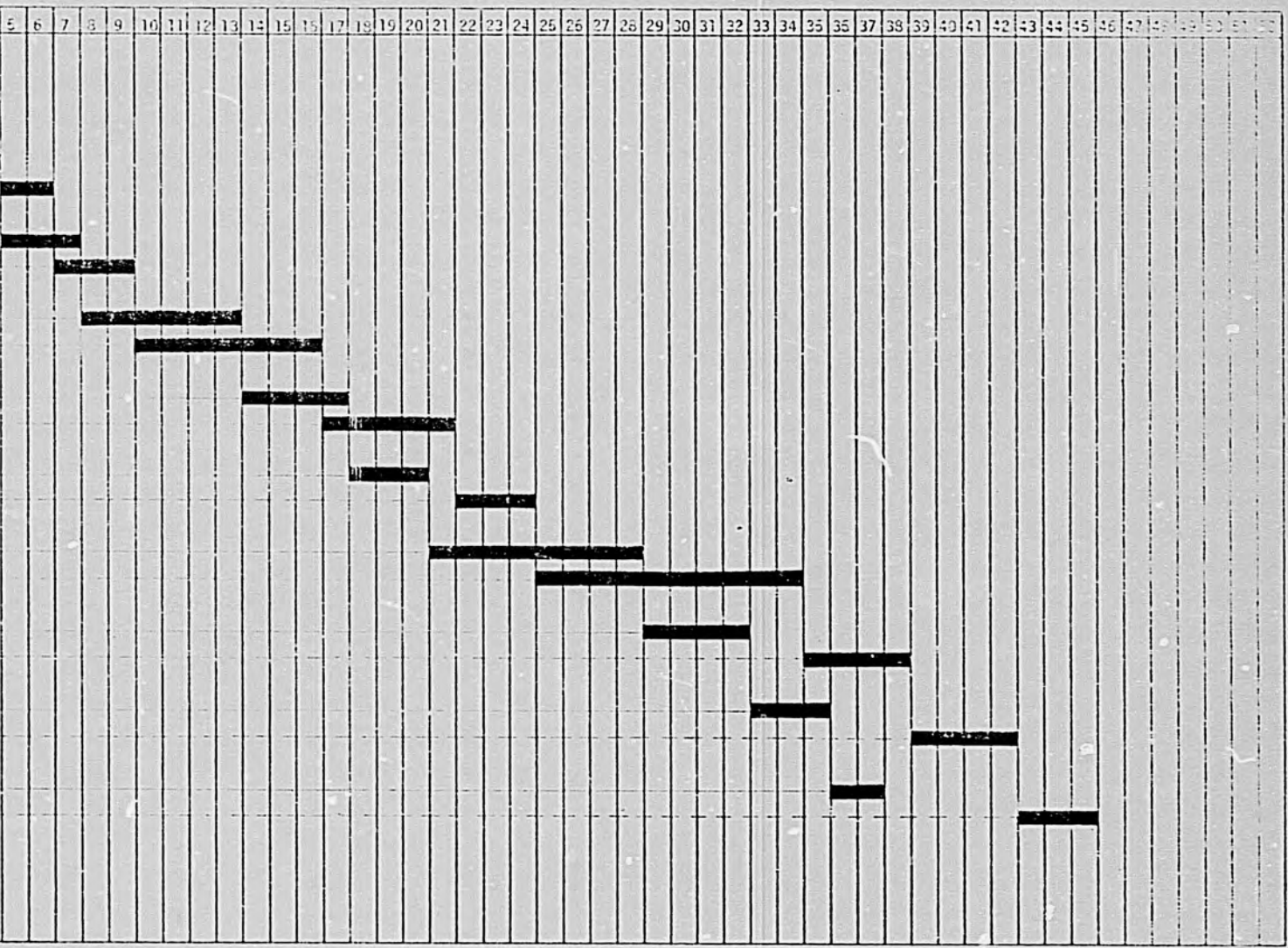
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

REHABILITATION WORK PROGRAM

DODOMA REGION
SOUTHERN MAINTENANCE TEAM
THIRD YEAR

Weeks

Road Section From - To	Total Km	1 Km	2 Km
Nondwa-Chifutuka	20		
1		20	
2			15
Chifutuka-Huzi	15		
1		15	
2			10
Huzi-Chinangulu	29		
1		29	
2			20
Mpwayungu-Huzi-Ilangali	60		
1		60	
2			45
Mbunguzi-Kwitikira-Mpwayungu	40		
1		40	
2			30
Ninoa-Kwitikira	30		
1		30	
2			20
Mbakwa-Rudi Road-Massa-Idodoma	78		
1		73	
2			60
Rudi-Chipajoro	37		
1		37	
2			25
Igoji-Mtamba	30		
1		30	
2			25
Mlowa-Barbaroni-Idifu	20		
1		20	
2			15
TOTAL:	359		265
Total Southern Maintenance Team:	1123		795



Work Item

1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

DODOMA REGION
NORTHERN MAINTENANCE TEAM
FIRST YEAR

REHABILITATION WORK PROGRAM

Weeks

Road Section (From - To)	Work Item Total Km	1 Km	2 Km
Trunk Road-Hombolo-Mela-Mela	52		
1		52	
2			40
[illegible]-Kuhunga-Gawaya	28		
1		28	
2			18
Hombolo Bum-Mkoyo-Kawawa	16		
1		16	
2			10
Hombolo-Tepesa	10		
1		10	
2			5
Imala-Chahwa-Vikonje	14		
1		14	
2			10
Bima-Galai-Tandala-Kolo	84		
1		84	
2			70
Chenba-Gotta	16		
1		16	
2			10
Area-Chenda-Mnjo Chino	48		
1		48	
2			35
Chendama-Jangalo	12		
1		12	
2			5
Jangalo-Tandala	21		
1		21	
2			15
Pahi-Bumbute-Chubi	37		
1		37	
2			25

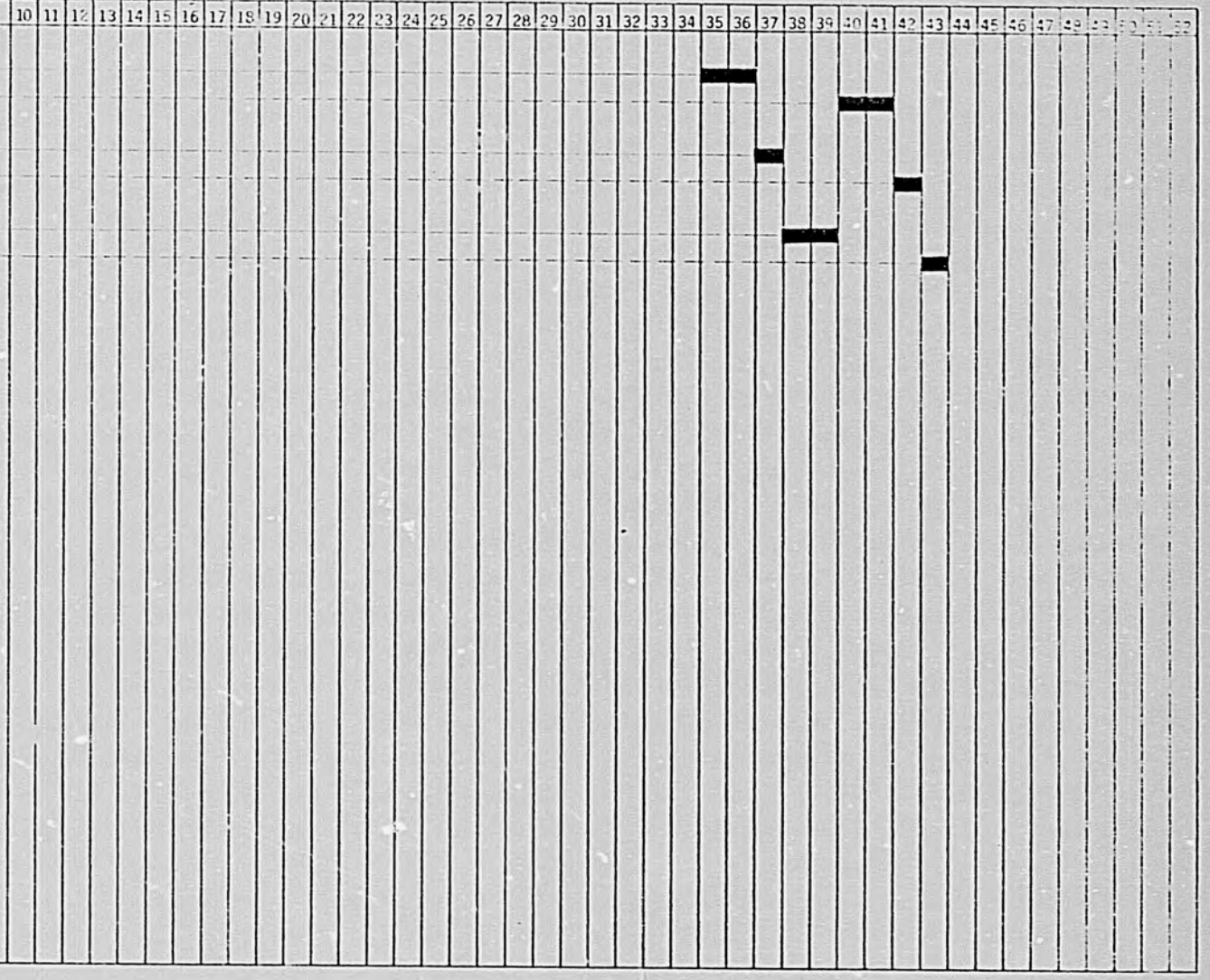
Work Item

1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

DODOMA REGION
NORTHERN MAINTENANCE TEAM
FIRST YEAR - CONTINUED

REHABILITATION WORK PROGRAM
Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Chogai-Arusha-Regional Boundary	16		
1		16	
2			10
Sumbuta-Chungai	12		
1		12	
2			5
Kisaki-Kisese	16		
1		16	
2			5
TOTAL:	322		
			263



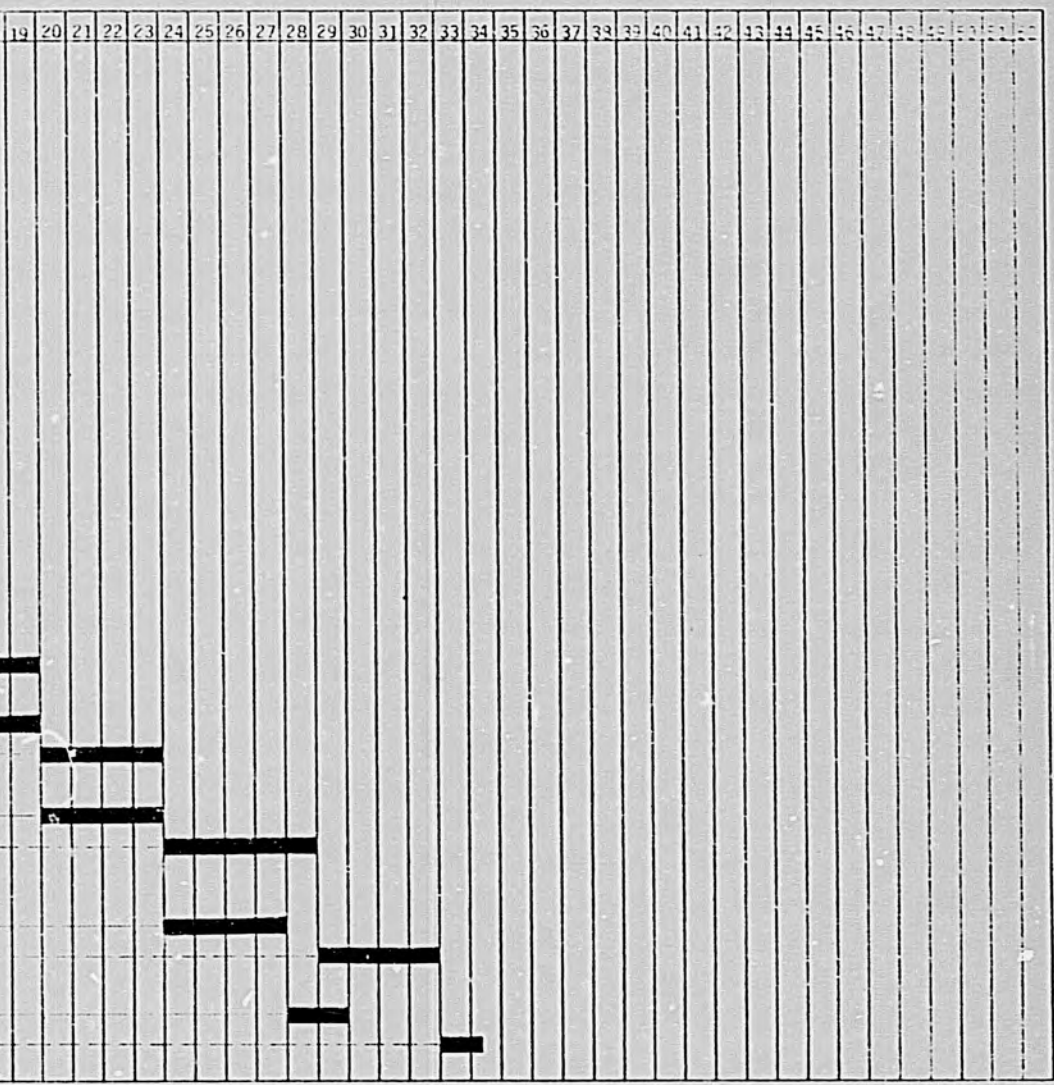
Work Item
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

DODOMA REGION
NORTHERN MAINTENANCE TEAM
SECOND YEAR

REHABILITATION WORK PROGRAM

Weeks

Point Section From - To	Work Item Total Km	1 Km	2 Km
Mnaye-Kisese-Kikore	50		
1		50	
2			30
Sabali-Mwitanga	27		
1		27	
2			15
Nala-Zuzu	10		
1		10	
2			5
Zuzu-Mbabala	20		
1		20	
2			10
Nala-Mualawala	10		
1		10	
2			5
Mualawala-Ilindi	24		
1		24	
2			15
Mualawala-Mundemu-Mzakwe	20		
1		20	
2			15
Mundemu-Lamatti	30		
1		30	
2			25
Lamatti-Mkakatika-Bahi	40		
1		40	
2			30
Chigongwe-Kigwe-Ngulugano-Chipanga	36		
1		36	
2			25
Kigwe-Mpinga-Ngulgano	17		
1		17	
2			10



Work Item

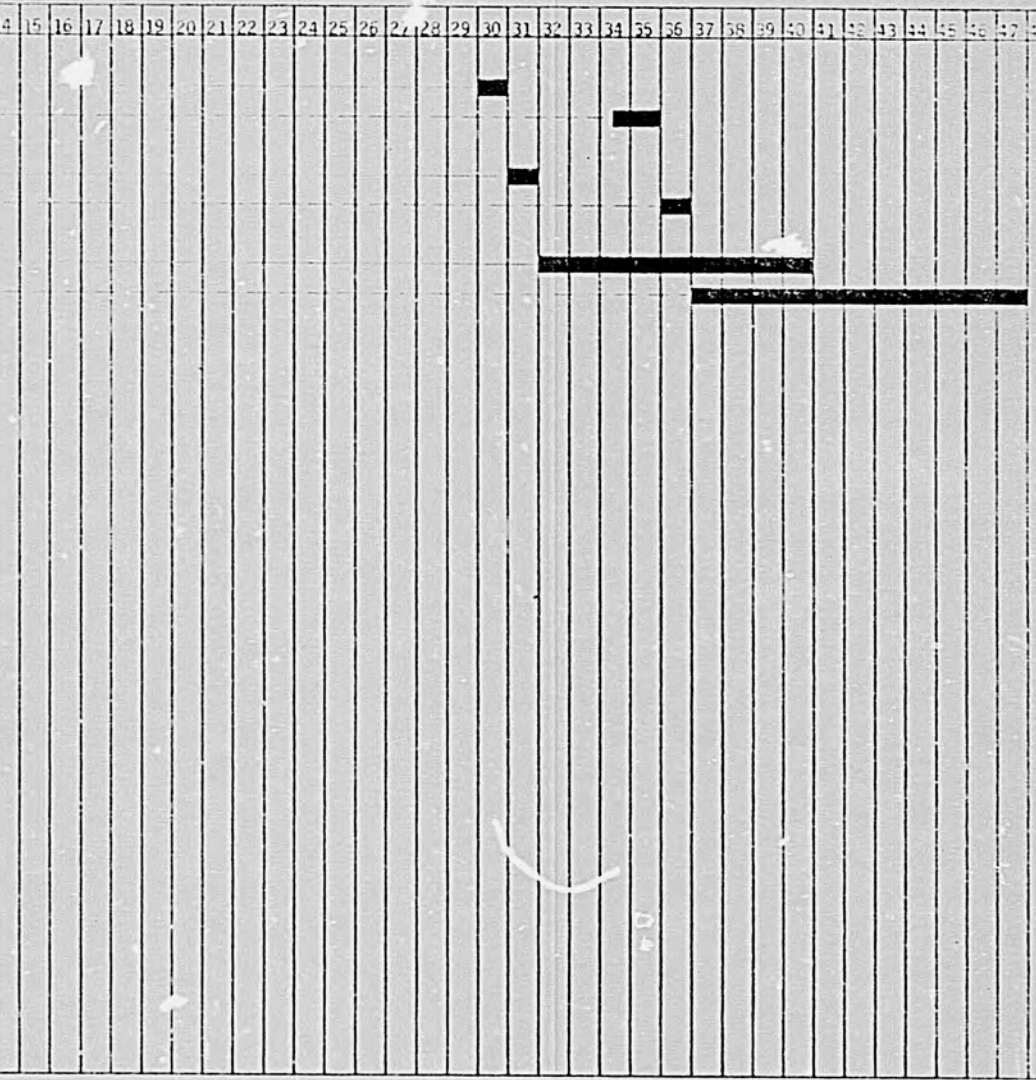
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

DODOMA REGION
NORTHERN MAINTENANCE TEAM
SECOND YEAR CONTINUED

REHABILITATION WORK PROGRAM

Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Trunk Road-Mzanga	13		
1		13	
2			10
Kilolowa-Chimangali-Majeleko	8		
1		8	
2			5
Mzanga-Kilolowa-Gabelo-Itiso	98		
1		98	
2			70
TOTAL	403		
			270



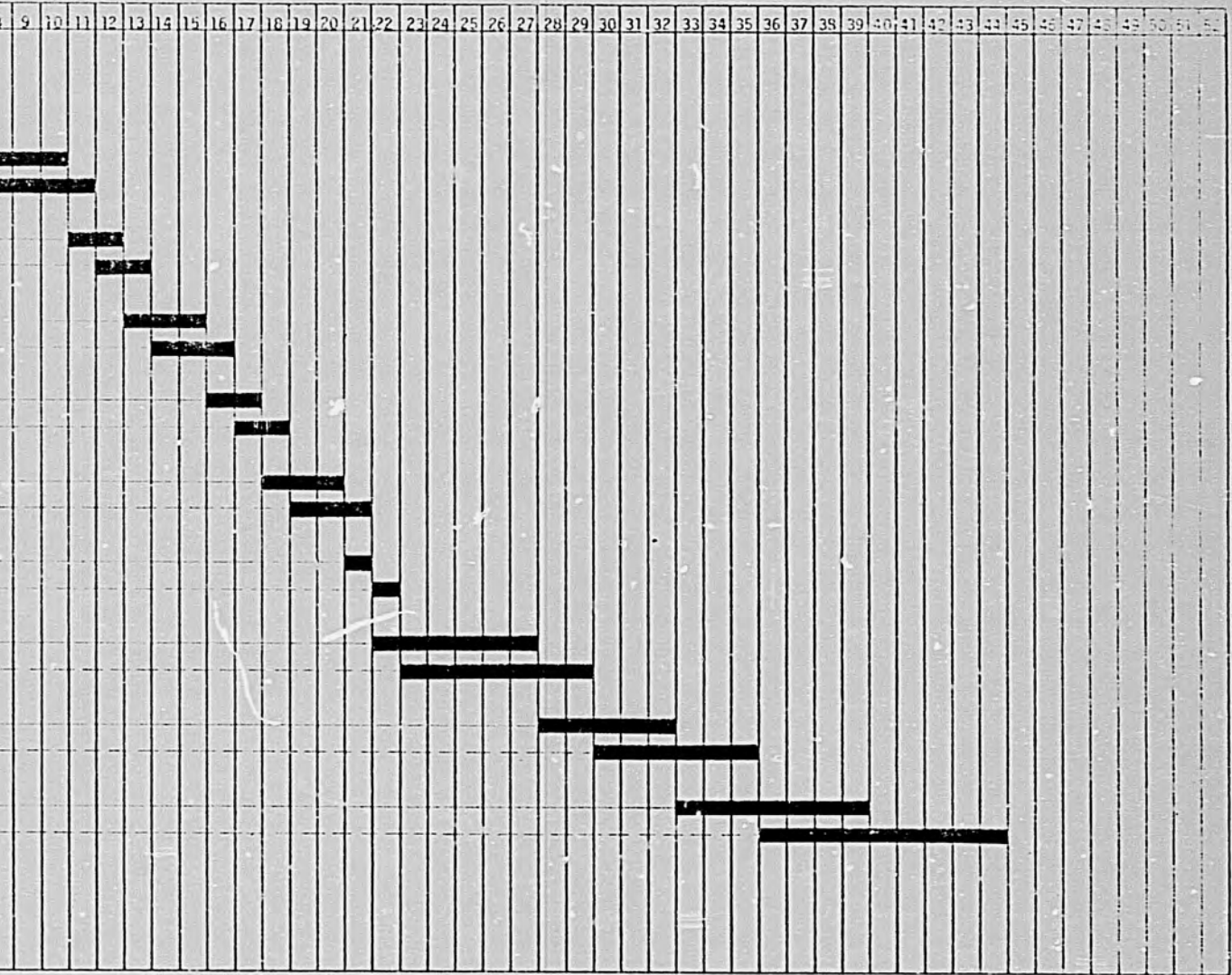
Work Item
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

DODOMA REGION
NORTHERN MAINTENANCE TEAM
THIRD YEAR

REHABILITATION WORK PROGRAM

Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Dabalo-Manyemba	20		
1		20	
2			18
Chenene-Itiso-Izava	79		
1		79	
2			40
Itiso-Ugiliwa	15		
1		15	
2			12
Itiso-Maneti	33		
1		33	
2			18
Maneti-Kurukwa	19		
1		19	
2			12
Kwadiho-Inawi	24		
1		24	
2			18
Bicha-Kondoa	3		
1		3	
2			3
Kondoa-Kwamtoro	56		
1		56	
2			45
Kwamtoro- Kinyamsindo	48		
1		48	
2			40
Kwamtoro-Babayu-Meia Meia	68		
1		68	
2			55
TOTAL:	365		261
NORTHERN MAINTENANCE TEAM TOTAL:	1150		794



Work Item

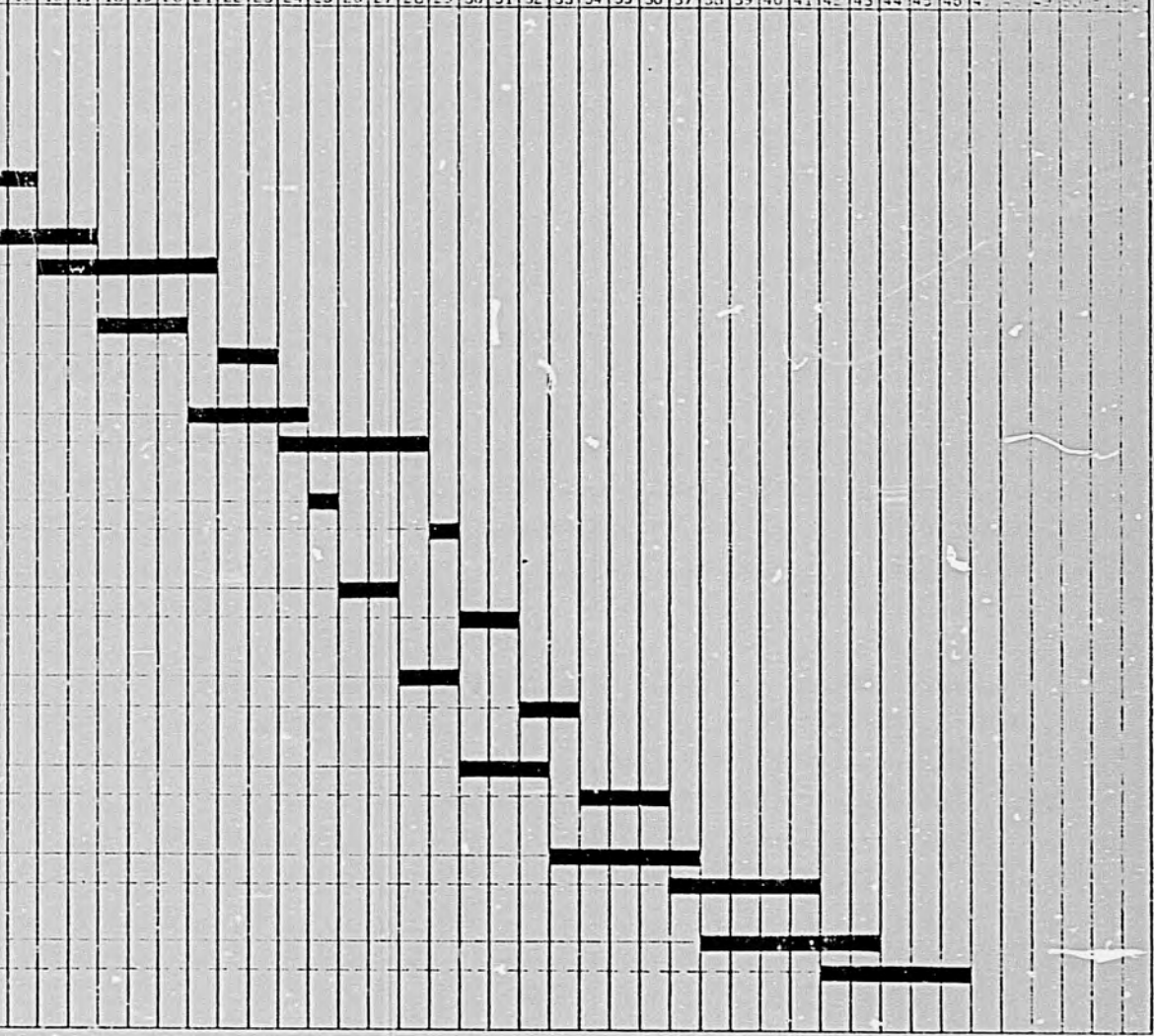
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

REHABILITATION WORK PROGRAM

SINGIDA REGION
SINGIDA MAINTENANCE TEAM
FIRST YEAR

Weeks

Road Section From - To	Total Km	Work Item 1 Km	Work Item 2 Km
Igugumo-Kinyangiri-Mwalama	20		
1		20	
2			65
Ngusi-Iambi-Nkungi	35		
1		35	
2			20
Ngusi-Kwalankala-Mungulu	58		
1		58	
2			35
Kwalankala-Mwanga-Kidarafa	28		
1		28	
2			15
Singida-Ilongero-Mtinko	40		
1		40	
2			30
Mtinko-Mudida	11		
1		11	
2			5
Ilongero-Merya-Mdilu	21		
1		21	
2			10
Singida-Sepuka	22		
1		22	
2			10
Sepuka-Manenge	35		
1		35	
2			15
Sepuka-Songambele-Kisaga	54		
1		54	
2			30
Songambele-Urughu-Kibigiri	56		
1		56	
2			30
TOTAL:	440		265



Work Item

1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

REHABILITATION WORK PROGRAM

SINGIDA REGION
SINGIDA MAINTENANCE TEAM
SECOND YEAR

Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Misigiri-Kiomboi-Kinakumi	32		
1		32	
2			20
Kiomboi-Kinakumi-Tulya-Doromani	74		
1		74	
2			60
Kiomboi-Msingi-Gumanga	40		
1		40	
2			25
Manyoni-Agwondi-Itigi	40		
1		40	
2			25
Agwondi-Mubanga-Ipande-Mbugani	49		
1		49	
2			30
Itigi-Chaya	43		
1		43	
2			25
Itigi-Gumalu	10		
1		10	
2			5
Manyoni-Kijiri	16		
1		16	
2			5
Manyoni-Heka	42		
1		42	
2			30
Heka-Sasilo	24		
1		24	
2			15

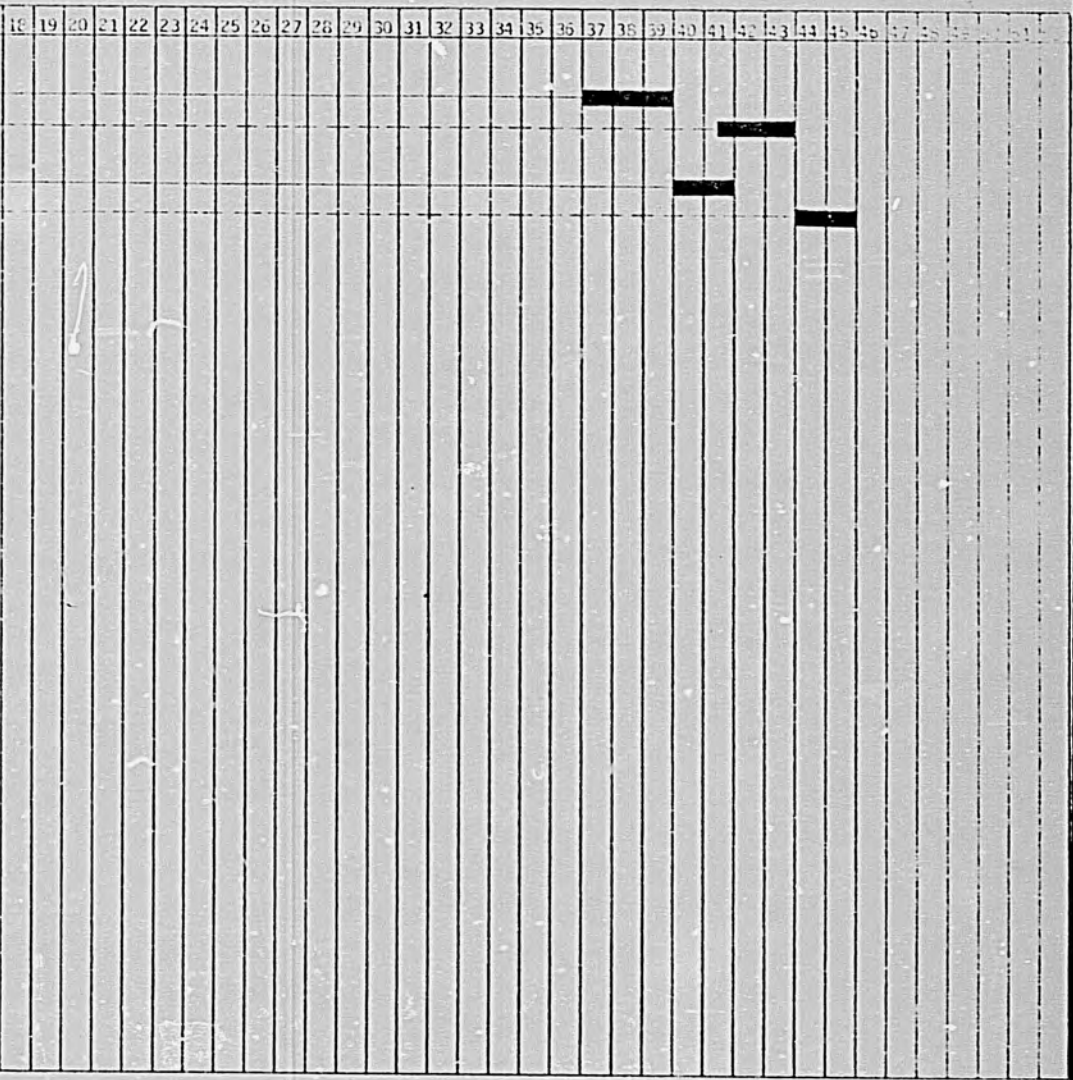
Work Item
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

REHABILITATION WORK PROGRAM

SINGIDA REGION
SINGIDA MAINTENANCE TEAM
SECOND YEAR CONTINUED

Weeks

Road Section From	To	Work Item Total Km	1 Km	2 Km
Heka-Nkonko		25		
	1		25	
	2			15
Nkonko-Kiomboi		19		
	1		19	
	2			10
TOTAL:		414		265



Work Item

1 = Clearing and Shaping (Km)

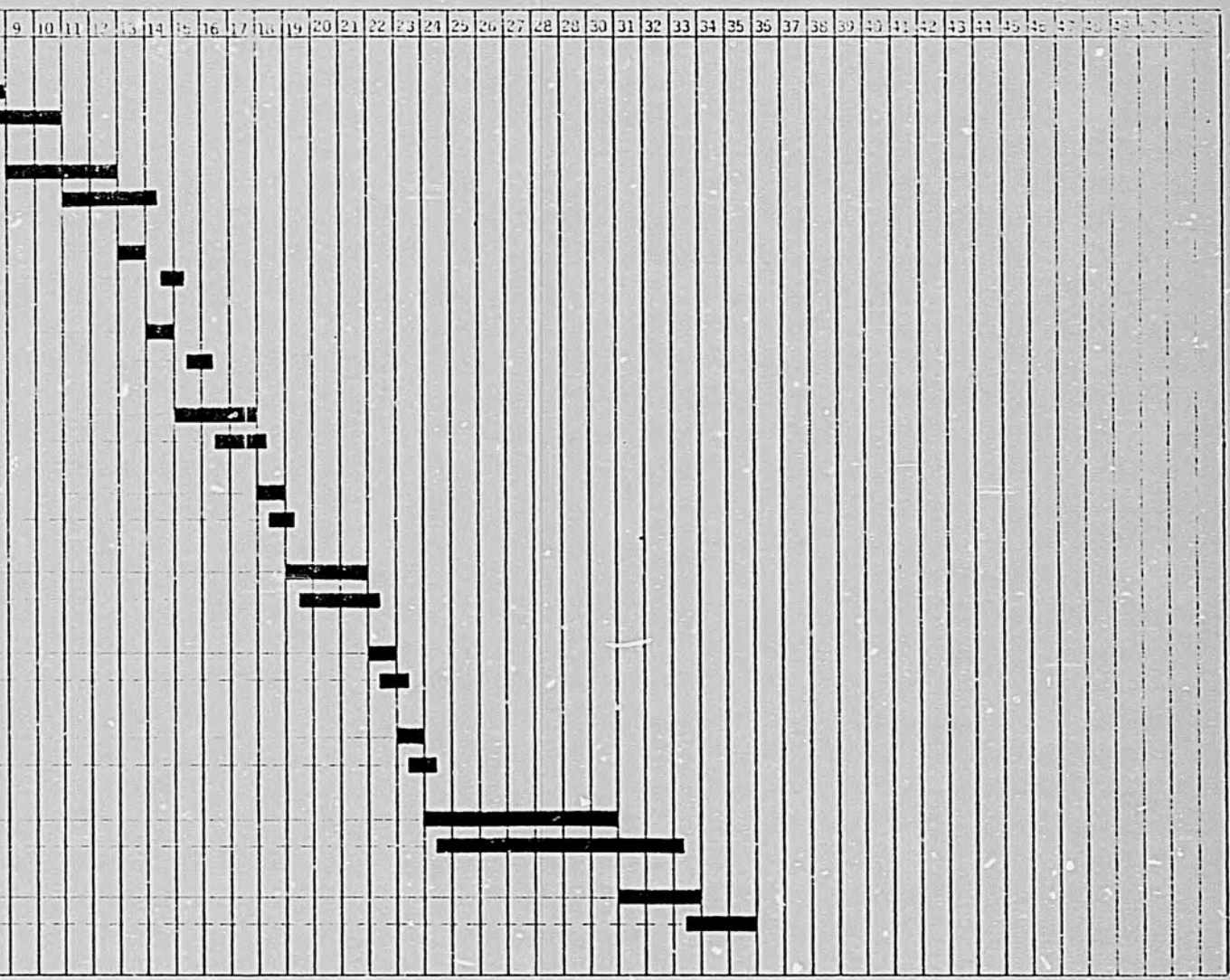
2 = Embankment and Surfacing (Km)

SINGIDA REGION
SINGIDA MAINTENANCE TERM
THIRD YEAR

REHABILITATION WORK PROGRAM

Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Wronko-Majiri	79		
1		79	
2			55
Majiri-Chikuyu	40		
1		40	
2			20
Majiri-Kinangali-Mikasuku	12		
1		12	
2			5
Mikasuku-Itetema	11		
1		11	
2			5
Mikasuku-Kitlamatinde-Solye	27		
1		27	
2			10
Trunk Road-Kintinku-Kitalolo	8		
1		8	
2			5
Kintinku-Mikanda	32		
1		32	
2			15
Chikuyu-Mukutupora	11		
1		11	
2			5
Chikuyu-Muwesa	8		
1		8	
2			5
Solye-Saranda-Hika-Londoni	72		
1		72	
2			55
Londoni-Mangonyi	29		
1		29	
2			15



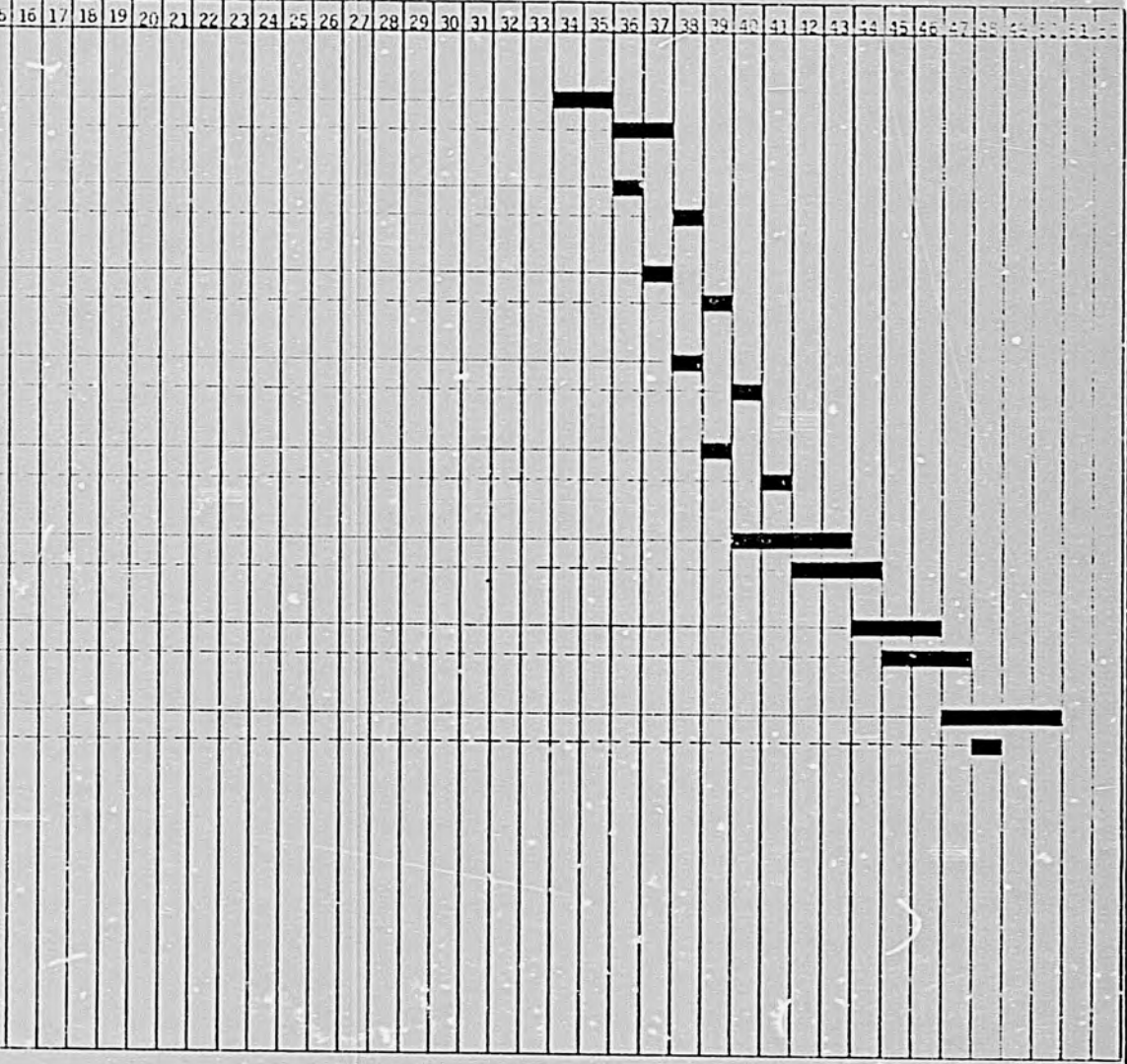
Work Item
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

REHABILITATION WORK PROGRAM

SINGIDA REGION
SINGIDA MAINTENANCE TEAM
THIRD YEAR CONTINUED

Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Mkiwanyi-Ikungi	24		
1		24	
2			15
Ikungi-Dunganyi	10		
1		10	
2			5
Dunganyi-Mungaa	13		
1		13	
2			5
Mungaa-Mankungu-Kititimo	14		
1		14	
2			5
Kititimo-Mgori	11		
1		11	
2			5
Mungaa-Misughaa-Kinyamsindo	39		
1		39	
2			20
Misughaa-Mtuntu-Mungaa	30		
1		30	
2			15
Singida-Ihanja-Matongo	51		
1		51	
2			5
TOTAL:	521		261
Maintenance Team Total:	1375		795



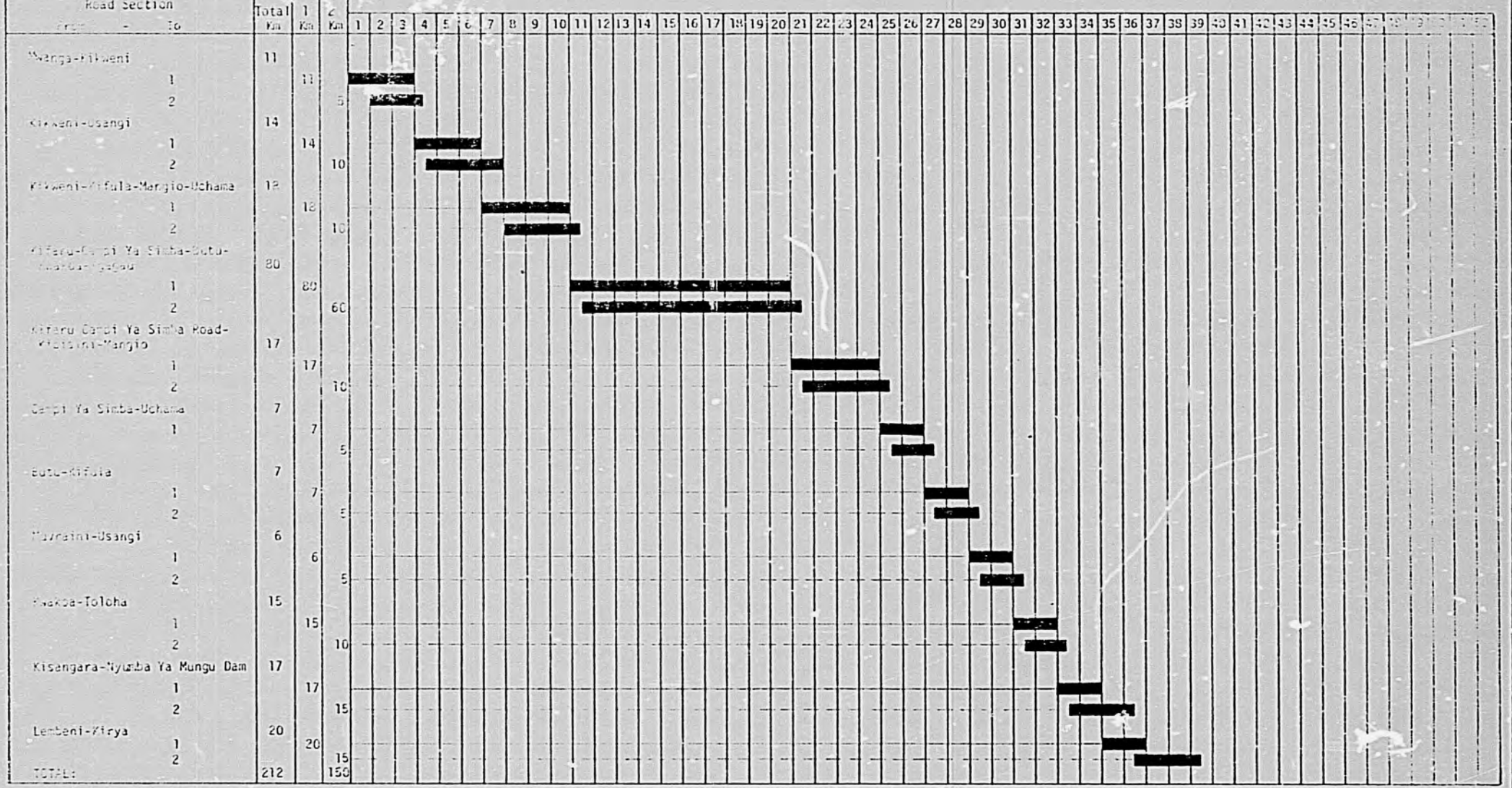
Work Item
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

KILIMANJARO REGION
SAME/MWANGA MAINTENANCE TEAM
FIRST YEAR

REHABILITATION WORK PROGRAM

Weeks

Road Section From - To	Total Km	Work Item 1 Km	Work Item 2 Km
Mwanga-Kikweni	11		
1		11	
2			5
Kikweni-Usangi	14		
1		14	
2			10
Kikweni-Kifula-Mangio-Uchama	12		
1		12	
2			10
Kifaru-Campi Ya Simba-Butu-Kwakoa-Ugogo	80		
1		80	
2			60
Kifaru Campi Ya Simba Road-Kisangini-Mangio	17		
1		17	
2			10
Campi Ya Simba-Uchama	7		
1		7	
			5
Butu-Kifula	7		
1		7	
2			5
Mzimaini-Usangi	6		
1		6	
2			5
Kwekoa-Tolcha	15		
1		15	
2			10
Kisangara-Nyumba Ya Mungu Dam	17		
1		17	
2			15
Lembeni-Kirya	20		
1		20	
2			15
TOTAL:	212		150



Work Item

1 = Clearing and Shaping (Km)
2 = Embankment & Surfacing (Km)

REHABILITATION WORK PROGRAM

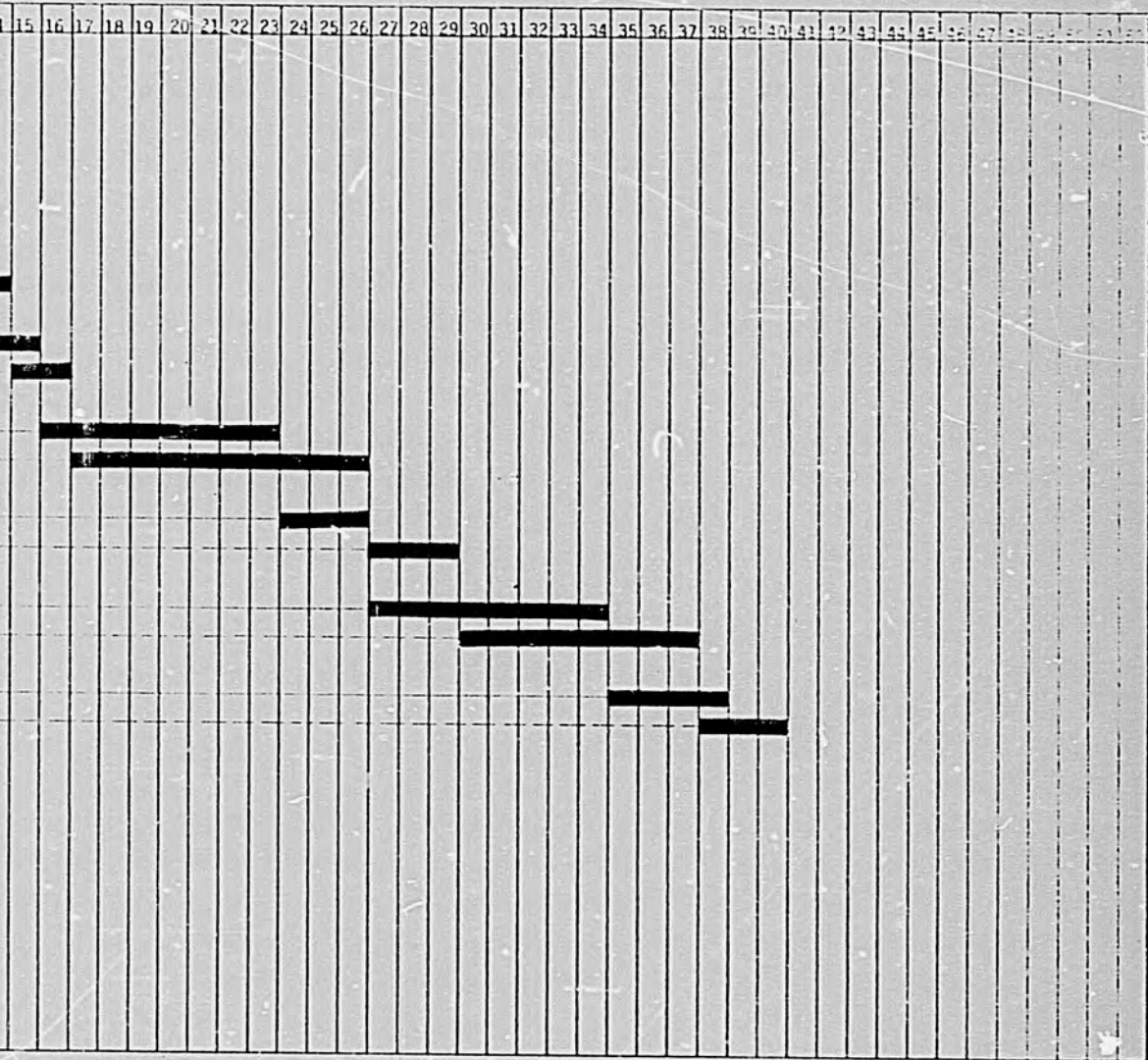
Weeks

KILIMANJARO REGION

SAME/MWANGA MAINTENANCE [illegible]

SECOND YEAR

Road Section From - To	Work Item Total Km	1 Km	2 Km
Msagau-Ndea	15		
1		15	
2			10
Mwanya-Mwembe	38		
1		38	
2			20
Kenya/Mwembe Road-Chome	19		
1		19	
2			10
Mwanyehi-Kudee	8		
1		8	
2			5
Mwanya-Kimbo-Meferejini	71		
1		71	
2			60
Meferejini - Same	26		
1		26	
2			15
Same-Mwembe-Manka-Mbindo	48		
1		48	
2			30
Mbindo-Kisiwani	16		
1		16	
2			10
TOTAL:	241		160



Work Item

1 = Clearing and Shaping (Km)

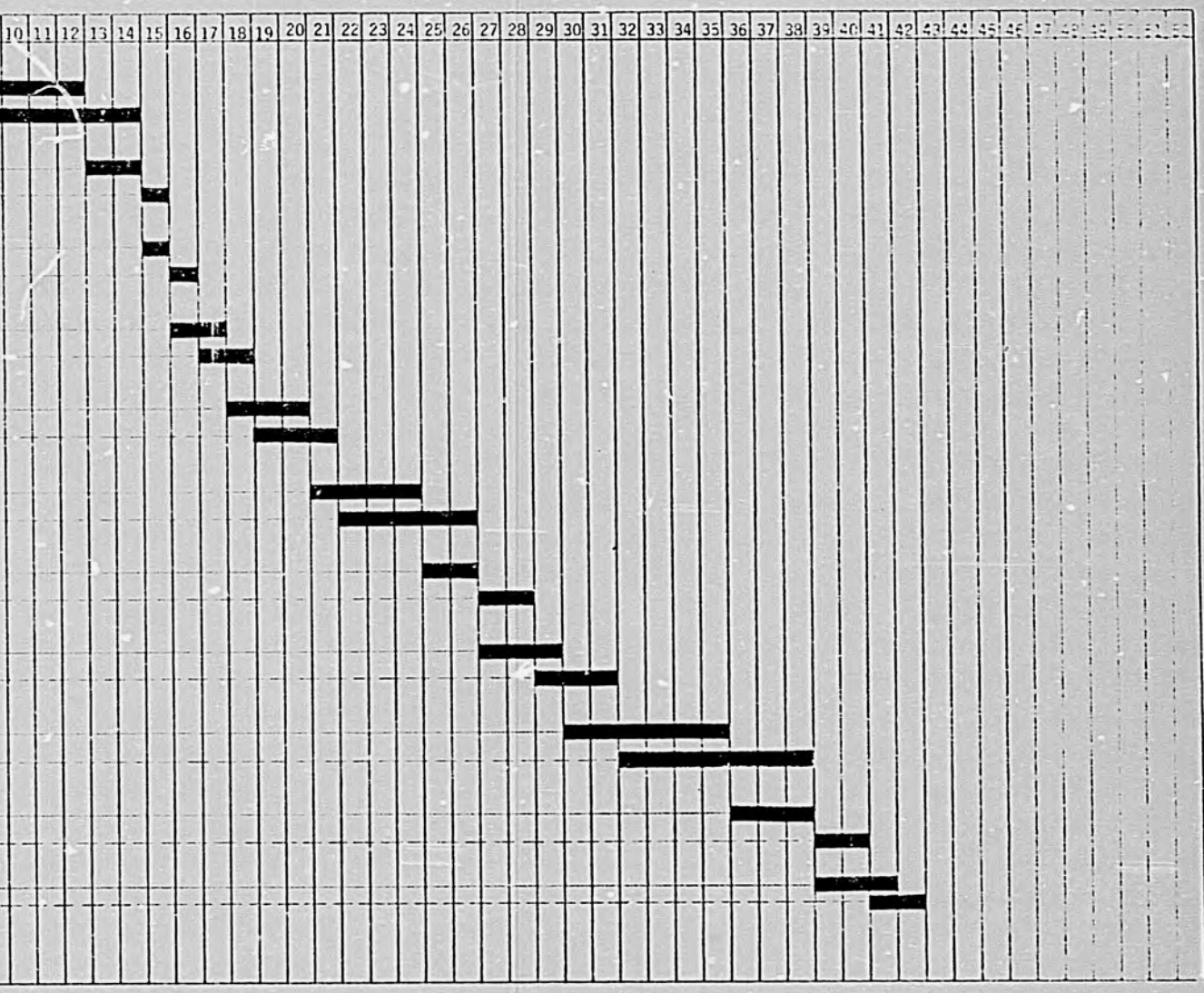
2 = Embankment and Surfacing (Km)

REHABILITATION WORK PROGRAM

KILIMANJARO REGION
SAME/MWANGA MAINTENANCE TEAM
THIRD YEAR

Weeks

Road Section From - To	Work Item Total Km	1 Km	2 Km
Makoja-Same-Marba	56		
1		56	
2			40
Upinani-Ndoa	12		
1		12	
2			5
Upinani-Ketanda	9		
1		9	
2			5
Ndoa-Mwanganzaghe	21		
1		21	
2			15
Ndungu-Marba	13		
1		13	
2			10
Kisiwani-Vuta	24		
1		24	
2			15
Mwanga-Kegongo	20		
1		20	
2			10
Kikangara - Upper Kikangara	15		
1		15	
2			10
Kikangara-Chanjali-Chonvu	30		
1		30	
2			20
Chonvu-Kwangi	15		
1		15	
2			10
Kwangi-Kikomani	15		
1		15	
2			5
Total	230		140
Maintenance Team Total	883		450



Work Item
1 = Clearing and Shaping (Km)
2 = Embankment and Surfacing (Km)

The work schedule was so arranged that the priorities were followed reasonably well and in such a grouping of project roads that prevents excessive team moves. The embankment and surfacing units follow the clearing and shaping unit on those roads scheduled for that activity.

5. Evaluation

a. Work Progress

Regular evaluation schedules will be established by the Project Coordinator, who, together with the Training Engineer, will visit each Team every four months for evaluation purposes in addition to other trips for operational purposes. Progress of the rehabilitation work will be compared to the schedule formulated prior to the work underway. Problems and delays will be discussed and resolved, and necessary adjustments to the schedule will be prepared.

Progress reports will be prepared by the Team leaders which will be discussed with the Project Coordinator during these evaluation visits. The Project Coordinator will inform the Regional Development Director and Regional Engineer and the District Development Directors and District Engineers of the progress and request assistance in adjusting schedules should this be considered necessary.

b. Training

The progress of all trainees and counterparts will be reviewed during the quarterly visits of the Project Coordinator and Training Engineers. Each trainee will be rated by his instructor as well as by the Equipment Operator Superintendent or the Mechanical Superintendent. The Counterpart Superintendents will also be consulted. Counterpart engineers and administrators will be rated by their expatriate advisors and the Team Leader.

The effectiveness of the training program can only be evaluated through such periodic ratings. Unqualified or unsuitable trainees

should be replaced. Those that are performing particularly well can be identified and rewarded by promotions.

One aspect of counterpart training and on-the-job training is that a certain rapport is necessary between the individuals involved. If this does not develop, the training may be ineffective. These relationships should be closely monitored and, if necessary, transfers or changes made.

6. Costs

The costs of the rehabilitation program are based on a 3-year time period for the accomplishment of the rehabilitation projects plus a preliminary 6-month period to prepare for the program.

The work will be performed out of four Maintenance Camps that are tentatively proposed in Chenene and Handali in Dodoma Region, Ikungi in Singida Region and Same in Kilimanjaro Region. The rehabilitation field crews will work as mobile units with two bunkhouse trailers and one office trailer provided for each team.

Expatriate staff will be housed in prefabricated houses imported into Tanzania and erected at the Maintenance Camps and at a central location for the Coordination Team. Babati appears to be the most accessible central location for the Coordination Team. Recent experience in Tanzanian field situations have shown that prefabricated houses should be used; importing complete units results in the least delay. Similarly, trailers were recommended for field crews to avoid time and parts losses experienced in other temporary portable accommodations.

A summary of the costs of the 3-year rehabilitation program is given in Table VII-16. Total U. S. Dollar cost is U.S. $18,374,505.00 (1980). Provisions for 10% contingencies, and assuming 10% yearly escalation results in a total cost of U.S. $20,204,275.00. The local costs are T/shs 65,377,796 (1980) and T/shs 72,095,330 with provisions for contingencies and escalation.

The cost figures are substantiated in the following tables, grouped by: (a) mobilization and overhead; (b) equipment costs and equipment operating costs; (c) direct labor costs; (d) summary costs; (e) bridge and drift costs; and (f) contingencies, escalation and cash flow.

TABLE VII-16

SUMMARY OF COSTS

3-YEAR ROADS REHABILITATION PROGRAM

	U.S.$	T/shs
Mobilization	2,165,705	920,000
Expatriate Salaries:		
Project Coordination	1,638,000	
Supervision	3,312,000	
Local Salaries		18,171,972
Fuel, Oil, Grease		34,450,224
Equipment Purchase	11,258,800	
New Bridge & Drift Construction		9,455,000
Utilities & Materials		2,380,600
SUBTOTALS (1980):	18,374,505	65,377,796
Contingencies	1,342,450	92,000
Escalation	487,320	6,625,656
TOTALS	20,204,275	72,095,452

a. Mobilization and Overhead

Mobilization and overhead costs are summarized in Table VII-17. Salaries, travel and housing for the expatriate Coordination Team and Field Supervision Teams are contained in Table VII-17B. Mobilization costs are itemized in Table VII-17B and are pro-rated to the various rehabilitation crews in Table VII-17A. These are also shown as direct weekly costs in Table VII-17C.

b. Equipment and Operating Costs

Equipment and equipment operating costs are provided in Table VII-18. Total equipment costs (1980) including freight and spare parts amount to U.S. $11,258,800.00. Equipment hourly operating costs are provided in Tables VII-19 and VII-20. Fuel and lubrication costs are given in Table VII-21.

c. Labor

Labor costs are detailed in Table VII-23. A summary is provided in Table VII-22.

The statutory minimum wage for rural areas (farmers 18 years and over) was established in 1975 as T/sh 8.85/day. Although the statutory minimum has not been revised upward since 1975, inflation alone dictates that the minimum of T/sh 8.85/day is no longer applicable. Additionally judgment and initiative are required from the maintenance worker who is working essentially alone, without daily supervision or guidance, and is expected to recognize future maintenance problems to discuss with the Roads Inspector on his monthly visits. A wage of T/sh 11.5/day was assumed for this study.

As emphasized in the report, the Government must budget sufficient funds to maintain the roads comprising the highway system or face a complete loss of the investment made for their construction and the increasing isolation of the towns and villages being served by the network. The estimated (unescalated) annual cost (Table VII-43) of T/sh 49 million (or slightly more than U.S. $6.1 million) to maintain an estimated 7,095 km of roads in the project region, is equivalent to about T/sh 6,900/year (or U.S. $862) per km, not an excessive amount to protect the investment made in construction and rehabilitation. The

wages paid to the maintenance worker at T/sh 2,400/km/year represents about 35% of the cost of maintenance and is money which is returned to the economy of the country.

It is recognized that the financial capability of the Government to fund future maintenance is a significant issue.

d. Direct Weekly Costs

A summary of direct weekly costs for the rehabilitation components are given in Table VII-24 and in costs per kilometer in Table VII-25. The summary costs per kilometer indicate clearing and shaping cost is T/shs 2,698 and embankment construction with granular surfacing material is T/shs 24,088. New culverts are calculated at T/shs 529 per lineal meter.

These figures compare reasonably well with recent work on the Arusha Planning and Village Development Project and the Tanga Integrated Rural Development Programme, which was completed in 1978.

e. Bridges and Drifts (Ref. Section VII. D.2)

Bridge and drift costs are summarized by region in Table VII-7. The costs of constructing a new drift 18 meters in length is estimated at T/shs 22,000, or approximately T/shs 1,225 per running meter. Single lane bridges 4.5 meters wide and made from reinforced concrete are estimated to cost T/shs 6,800 per meter for single span and T/shs 7,500 and T/shs 8,000 per meter for two and more than two spans respectively. These costs are based on T/shs 2,000 per cubic meter of reinforced concrete in place and T/shs 500 per cubic meter of masonry wing-walls.

TABLE VII-17

A. MOBILIZATION AND OVERHEAD COST SUMMARY

1. MOBILIZATION COSTS

a. Coordination Team (1 Team)

	U.S.$	T/shs
International Travel	70,725	
Office Equipment & Supplies	10,000	
Prefabricated Houses	375,000	
Concrete Slabs & Erection of Houses		200,000
SUBTOTALS:	455,725	200,000
b. Supervision Teams (4 teams):		
International Travel (38,495 x 4)	153,980	
Office Equipment & Supplies	80,000	
Prefabricated Houses (225,000 x 4)	900,000	
Prefabricated Workshop (144,000 x 4)	576,000	
Concrete Slabs & Erection of Houses (12 houses)		480,000
Concrete Slabs & Erection of Shops (60,000 x 4)		240,000
SUBTOTALS:	1,709,980	720,000
TOTALS:	2,165,705	920,000

2. OVERHEAD COSTS

	TOTAL COST/YEAR	
a. Coordination Team	U.S.$	T/shs
Local Staff Salaries		137,592
Expatriate Salaries	468,000	
Utilities for Housing		104,000
Vehicle Operation		75,600
In-Country Per Diem		144,000
TOTAL COST/YEAR	468,000	461,192
x 3.5 year program	1,638,000	1,614,172

Pro-rate to 4 Rehab. Teams:
$468,000 x T/shs 8/$ = T/shs 3,744,000 + 461,192 = T/shs 4,205,192
T/shs 4,205,192 ÷ 4 field teams = T/shs 1,051,298/Team
T/shs 1,051,298 ÷ 40 workweeks/year = 26,282/Week/Team
Clearing and Shaping @ 15% = 3,942
Embankment & Surfacing @ 80% = 21,026
Culvert, Drift Unit @ 5% = 1,314

b. Supervision Team (4 Teams)	Cost/Team/Year U.S.$	Cost/Team/Year T/shs	Total Cost Per Year U.S.$	Total Cost Per Year T/shs
Expatriate Salaries	276,000		1,104,000	
Utilities for Housing		62,400		249,600
Utilities for Shops		41,600		166,400
TOTAL COST	276,000	104,000	1,104,000	416,000
x 3 year program			3,312,000	1,248,000

Pro-rate to Operating Units:
$276,000 x T/shs 8/$ = T/shs 2,208,000 + 104,000 = T/shs 2,312,000
T/shs 2,312,000 ÷ 40 workweeks/year = T/shs 57,800/week
Clearing and Shaping @ 15% = 8,670
Embankment and Surfacing @ 80% = 46,240
Culvert, Drift Unit @ 5% = 2,890

TABLE VII-17

B. MOBILIZATION AND OVERHEAD COST BACKUP

1. SALARIES

a. Coordination Team	Billing Rate/Mo. (U.S.$)	Cost/Mo. (U.S.$)	Cost/Week (4.33 week/mo.) (U.S.$)
Project Coordinator	$8,500		
Chief Highway Engineer	8,000		
Highway Engineer/ Training Supervisor	8,000		
Parts/Stores Officer	7,000		
Office Manager	7,500	$39,000.00	$9,007.00
b. Supervision Teams (Per Team)			
Highway Engineer	$8,000		
Mechanical Superintendent	7,500		
Equipment Operating Superintendent	7,500	$23,000.00	$5,312.00

2. INTERNATIONAL TRAVEL

a. International Transportation @ $2,000/R.T. (Home leave after 2 yrs., married)

Coordination Team	No. in Family	No. of Round Trips	Cost of Air Travel (U.S.$)
Project Coordinator	3	2 (3) = 6	$12,000.00
Chief Highway Engineer	3	2 (3) = 6	12,000.00
Highway Engineer/ Training Supervisor	3	2 (3) = 6	12,000.00
Parts/Stores Officer	2	2 (2) = 4	8,000.00
Office Manager	2	2 (2) = 4	8,000.00
			$52,000.00
Supervision Teams (Per Team)			
Highway Engineer	3	2 (3) = 6	$12,000.00
Mechanical Superintendent	2	2 (2) = 4	8,000.00
Equipment Operating Superintendent	2	2 (2) = 4	8,000.00
			$28,000.00

b. Visa, Shots, etc. @ $125/person

Coordination Team: 13 people @ $125/each = $1,625.00
Supervision Team: 7 people @ $125/each = 875.00

c. International Per Diem (1 night/trip) ($75/night/family)

Coordination Team: (Per Team) 5 people x 4 nights @ $75/night = $1,500.00
Supervision Team: 3 people x 4 nights @ $75/night = 900.00

d. In-country Accommodation — Dar es Salaam
Per Diem @ $60/day x 2 days/R.T.

Project Coordination:	5 people x 4 nights @ $60/night =	$1,200.00
	3 people x 4 nights @ $60/night =	720.00

e. Air Freight (200 kg/employee; 100 kg/dependent) $4.00/kg each way)

Coordination Team:	1,800 kg x $4.00 x 2 trips =	$14,400
Supervision Teams:	1,000 kg x $4.00 x 2 trips =	8,000

3. SUMMARY, INTERNATIONAL TRAVEL

a. Coordination Team:

International Air Travel	$52,000.00	
Visas, Shots, etc.	1,625.00	
International Per Diem	1,500.00	
In-Country Accommodation	1,200.00	
Air Freight	14,400.00	$ 70,725.00

b. Supervision Teams: (Per Team)

International Air Travel	$28,000.00	
Visas, Shots, etc.	875.00	
International Per Diem	900.00	
In-country Accommodation	720.00	
Air Freight	8,000.00	38,495.00

c. Miscellaneous Costs

Coordination Team

Office Equipment & Supplies (est.)	10,000.00	
Housing (Prefabricated)		
1,500 Sq.Ft. each @ $50/SF = $75,000/ea. 5 houses req'd	375,000.00	

Supervision Teams (4 Teams)

Offices & Survey Equipm't & Supplies (est.) @ $20,000/team	80,000.00	465,000.00

Housing (Prefabricated)

1,500 Sq.Ft. each @ $50/S.F.
= $75,000/each 3 houses/team
= $225,000/Team x 4 Teams $900,000.00

Workshops (Prefabricated)
7,200 Sq.Ft. @ $20/S.F. =
$144,000 ea. x 4 Teams = 576,000.00 $1,476,000.00

4. COORDINATION TEAM - Local Cost

a.

Local Staff	No.	Total Hrs.	Rate/Hr. (T/shs)	Week Total (T/shs)
Office Manager	1	42	8.0	336.0
Storekeeper	1	42	6.0	252.0
Clerk	2	84	3.0	252.0
Typist	2	84	3.0	252.0
Messenger	2	84	2.5	210.0
Driver	4	168	3.0	504.0
Wardens, Janitors	8	336	2.5	840.0

TOTAL LABOR : T/shs 2,646.0 /week = T/shs 137,592/year

b. Utilities for Housing:
5 each @ T/shs 400/week - T/shs 2,000/week = T/shs 104,000/year

c. Slabs and erection of housing @ T/shs 40,000 each
5 each @ T/shs 40,000 = T/shs 200,000

d. Equipment Operation (5 vehicles) @ T/shs 6,300/week = T/shs 75,600/year

e. In-Country Per Diem: 30 days/mo. x T/shs 400/day x 12 months =
T/shs 144,000/year

5. SUPERVISION TEAMS — Local Cost

a. Utilities for Housing:
3 each/team @ T/shs 400/week = T/shs 1,200/week =62,400/year
4 teams @ T/shs 62,400/year T/shs = 249,600/year

b. Utilities for Shop:
1 each/team @ T/shs 800/week T/shs = 41,600/year
4 teams @ T/shs 41,600/year T/shs = 166,400/year

c. Slabs and Erection of Shops:
1 each team @ T/shs 60,000
4 teams @ T/shs 60,000 each T/shs = 240,000/year

d. Slabs and Erection of Houses:
3 @ T/shs 40,000 ea. x 4 teams T/shs = 480,000

TABLE VII-17

C. OVERHEAD TO BE ADDED TO DIRECT WEEKLY COSTS

WEEKLY PRODUCTION	OPERATING UNIT	PROJECT COORD. TEAM	FIELD SUPER. TEAM	TOTAL	UNIT COST (T/shs)
10 KM	Clearing and Shaping Unit	3,942	8,670	12,612	1,261
6 KM	Embankment and Surfacing Unit	21,026	46,240	67,266	11,211
40 M	Culvert Unit	1,314	2,890	4,204	105
	TOTAL OVERHEAD	26,282	57,800	84,082	

TABLE VII-18

EQUIPMENT TO BE PURCHASED FOR EACH FIELD REHABILITATION TEAM

ITEM	NO.	1980 COST U.S. $	TOTAL COST (U.S.$)	LIFE (HOURS)	DEPRECIATION COST LIFE (U.S. $)
Dozer/ripper (D-7)	1	155,000	155,000	10,000	15.50
Grader (140C)	2	106,300	212,600	15,000	17.09
Front End Loader W/hoe (930)	1	62,900	62,900	10,000	6.29
(955) Front End Loader, Track	1	88,700	88,700	12,000	7.39
Compactor, (811)	1	104,400	104,400	12,000	8.70
Dump Truck (5-7yd.)	8	41,000	328,000	20,000	2.05
Water Truck (2,000 gal)	1	41,000	41,000	20,000	2.05
Water Trailer (750 gal)	1	11,500	11,500	20,000	0.58
Tractor/back hoe (JD 510)	1	53,100	53,100	15,000	3.54
Tractor (JD 510) 80 hp	1	48,000	48,000	20,000	2.40
Office Trailer	1	43,200	43,200	20,000	2.16
Fuel/Lube/Mech. Truck	1	35,000	35,000	12,000	2.92
Tractor/Lowbed (40T)	1	65,300	65,300	20,000	3.27
Pick-Up (3/4Ton)	4	7,000	28,000	10,000	0.70
Flatbed/Crane	1	60,000	60,000	10,000	6.00
Concrete Mixer, (Towed)	2	17,700	35,400	20,000	0.89
Vibrator, Conc. (1-1/2")	4	700	2,800	10,000	0.07
Compressor(340cfm)	1	32,100	32,100	10,000	3.21
Air Tools (sets)	2	2,200	4,400	10,000	0.22
Tank/Trailer-fuel stg.	2	41,600	83,200	20,000	2.08

ITEM	NO.	1980 COST (U.S. $)	TOTAL COST (U.S. $)	LIFE HOURS	DEPRECIATION = COST ÷ LIFE (U.S. $)
Culvert forms	6	700	4,200	20,000	0.03
Pumps (3")	4	1,000	4,000	10,000	0.10
Bunkhouse Trailer	2	4,000	8,000	10,000	0.40
EQUIPMENT PURCHASE SUBTOTALS:			1,510,800		
Shop Tools & Equipment (estimate)			200,000		

SUBTOTAL	1,710,800
Freight & Handling @ 15% Equipment Cost	256,600
**Spare parts, tires, etc. @ 40% Equipment Cost	684,300
SUBTOTAL PER TEAM	2,651,700
Additional Spare Parts for 3rd year	150,000
TOTAL 1 TEAM	2,801,700
4 Teams: TOTAL EQUIPMENT COST	11,206,800
Coordination Team (1 Team)	52,000
GRAND TOTAL, EQUIPMENT COST	$11,258,800

EQUIPMENT TO BE PURCHASED FOR COORDINATION TEAM

Sedan	1	9,000	9,000
Pickup (3/4Ton)	4	7,000	28,000
TOTAL			37,000
+ spare parts, tires, transportation etc. @ 40% Cost			15,000
TOTAL (1 required)			$52,000

**Spare parts, tires @ 20%/year for 2 years
Reorder additional spares at end 1st year
for last years, (after 1 year of operation)
estimate $150,000.00

TABLE VII - 19

EQUIPMENT OPERATING COSTS
FIELD REHABILITATION UNIT

UNIT	NO.	HOURS/WEEK	TOTAL HRS.	RATE/HR. (T/shs)	TOTAL/WEEK (T/shs)
A. CLEARING & SHAPING					
Grader	1	36	36	103.60	3,729.60
Loader/Wheeled	1	24	24	75.04	1,800.96
Dump Truck	1	24	24	127.20	3,054.72
DIRECT OPERATING COSTS/WEEK					8,585.28
B. EMBANKMENT & SURFACING					
Dozer	1	36	36	137.52	4,950.72
Grader	1	36	36	103.60	3,729.60
Loader, Tracked	1	36	36	108.24	3,896.64
Compactor	1	36	36	158.80	5,716.80
Dump Truck	6	36	216	127.28	27,492.48
Water Truck (2,000 gal)	1	36	36	127.28	4,582.08
DIRECT OPERATING COSTS/WEEK					50,368.32
C. CULVERTS					
1. CULVERT CONSTRUCTION					
Tractor/Back Hoe	1	30	30	46.64	1,399.20
Concrete Mixer	1	36	36	74.00	2,664.00
Vibrator	1	36	36	10.00	360.00
DIRECT OPERATING COSTS/WEEK					4,423.20
2. CULVERT FABRICATION					
Concrete Mixer	1	36	36	74.00	2,664.00
Vibrator	1	36	36	10.00	360.00
Forms	6	36	216	10.00	2,160.00
DIRECT OPERATING COSTS/WEEK					5,184.00
TOTAL					9,607.20

D. FIELD SUPPORT	NO.	HRS./WEEK	TOTAL/HRS.	RATE/HR. (T/shs)	TOTAL/WEEK (T/shs)
Bunkhouse Trailers	2	48	96	10.00	960.00
Office Trailer	1	48	48	10.00	480.00
Fuel/Lube/Mech. Truck	1	42	42	127.92	5,372.64
Pick-Up	4	48	192	21.84	4,193.28
Lowbed/Tractor	1	24	24	137.68	3,304.32
Portable Water Tank (350 gal)	1	48	48	10.00	480.00
Flatbed/Crane	1	36	36	128.48	4,625.28
Dump Truck	1	36	36	127.28	4,582.08
Tractor (80 hp)	1	24	24	44.88	1,077.12
Air Compressor/Tools	1	12	12	119.20	1,430.40
Fuel Trailer	1	48	48	50.00	2,400.00
DIRECT COST EQUIPMENT OPERATION					28,905.12

Prorate to Operating Unit:

1. Clearing and Shaping: 15% = 4,335.80
2. Embankment and Surfacing: 80% = 23,124.10
3. Culvert: 5% = 1,445.20

TABLE VII - 20

DIRECT OPERATING COSTS FOR EACH FIELD REHABILITATION UNIT

A. Equipment Hourly Operating Cost

Unit	Consumption (liter/hr.)	Fuel Cost @ $0.50/ liter	Lube, Oil, Grease Filters (U.S. $)	Tires (U.S.$)	Parts (U.S.$)	TOTAL (U.S.$)	HOURLY COSTS (T/shs)
D-7 Tractor/ripper	29.0	14.50	0.29		2.40	17.19	137.52
Grader (1406)	19.7	9.85	0.57	0.60	1.93	12.95	103.60
Loader, Wheel (930)	14.0	7.00	0.24	0.64	1.50	9.38	75.04
Loader, Track (955)	21.6	10.80	0.25		2.48	13.53	108.24
Compactor (811)	34.1	17.05	0.40		2.40	19.85	158.80
Dump Truck (5-7 yd.)	24.6	12.30	0.40	0.46	2.75	15.91	127.28
Water Truck (2,000 gal.)	24.6	12.30	0.40	0.46	2.75	15.91	127.28
Tractor/Backhoe (I.D.510)	6.8	3.40	0.39	0.27	1.93	5.83	46.64
Tractor (80 hp)(I.D 510)	6.8	3.40	0.39	0.11	1.93	5.61	44.88
Fuel/Lube Truck	24.6	12.30	0.48	0.46	2.75	15.99	127.92
Tractor/Lowbed (40 T)	24.6	12.30	0.48	1.68	2.75	17.21	137.68
Pickup (3/4 T)	4.0	2.00	0.20	0.18	0.35	2.73	21.84
Flatbed/Crane	24.6	12.30	0.48	0.53	2.75	16.06	128.48
Concrete Mixer (Towed)	6.0	3.00	0.60		3.72	7.32	74.00
Compressor (340 cfm)	24.6	12.30	0.60		2.00	14.90	119.20

B. Local Cost for Fuel, Oil, Lubricants, Grease (Local Cost Component)

	Fuel	Oil, Lube, Grease
D-7 Tractor	14.50	0.25
Grader	9.85	0.53
Loader, Wheel	7.00	0.20
Loader, Truck	10.80	0.21
Compactor	17.05	0.36
Dump Truck	12.30	0.36
Water Truck	12.30	0.36
Tractor/Backhoe	3.40	0.35
Tractor (80 hp)	3.40	0.35
Fuel/Lube Truck	12.30	0.44
Tractor/Lowbed	12.30	0.44
Pickup	2.00	0.16
Flatbed/Crane	12.30	0.44
Concrete Mixer	3.00	0.56
Compressor	12.30	0.56

TABLE VII - 21

FUEL & LUBE COST, EQUIPMENT OPERATION
4 TEAMS AND 3-YEAR PROGRAM

UNIT	HRS./WEEK	COST/HR. (T/shs)	TOTAL/WEEK (T/shs)	40 WEEKS/YEAR (T/shs)
A. Clearing and Shaping				
Grader	36	83.0	2,988.0	
Loader, Wheel	24	57.6	1,382.4	
Dump Truck	24	101.3	2,431.2	
			6,801.6	272,064.0
B. Embankment and Surfacing				
Dozer	36	118.0	4,248.0	
Grader	36	83.0	2,988.0	
Loader, Track	36	88.0	3,168.0	
Compactor	36	139.3	5,014.8	
Dump Truck	216	101.3	21,880.8	
Water Truck	36	101.3	3,646.8	
			40,946.4	1,637,856.0
C. Culvert/Ditch, etc.				
Tractor/Backhoe	36	30.0	1,080.0	
Concrete Mixer	72	28.5	2,052.0	
			3,132.0	125,280.0
D. Support				
Fuel/Lube Truck	42	101.9	4,279.8	
Pick-Up	192	17.3	3,321.6	
Lowbed/Tractor	24	101.9	2,445.6	
Flatbed/Crane	36	101.9	3,668.4	
Dump Truck	36	101.3	3,648.8	
Tractor (80 hp)	24	30.0	720.0	
Air Compressor	12	102.9	1,234.8	
SUBTOTAL:			19,317.0	772,680.0
TOTAL/YEAR/TEAM				2,807,880.0
4 TEAMS x 3 YEARS:				33,694,560.0
E. Field Supervision				
Pick-Ups	240	17.3	4,152.0	
3.5 YEARS @ 52 WEEKS/YEAR:				755,664.0
GRAND TOTAL:				34,450,224.0

TABLE VII - 22

SUMMARY — LABOR COSTS

		Cost/Week (T/shs)
A.	Rehabilitation Team	
	1. Cleaning and Shaping	2,520.0
	2. Embankment and Surfacing	9.492.0
	3. Culvert	4,116.0
	4. Field Support	2,688.0
	5. Mechanical Shop	7,896.0
	6. Supervisory Support Staff	1,638.0
	SUBTOTAL	28,350.0 @ 52 weeks/year = 1,474,200/year
		x 4 Teams & 3-yr. Program = T/shs 17,690,400
B.	Coordination Team	
	Local Salaries: 137,592/year x 3.5 years =	481,572
	TOTAL PROJECT LABOR	T/shs 18,171,972

TABLE VII - 23

DIRECT LABOR COSTS FOR EACH FIELD REHABILITATION UNIT

UNIT	NO.	RATE/HR. (T/shs)	RATE/WEEK (42 HRS.)	TOTAL/WEEK
A. CLEARING & SHAPING				
Foreman	1	8.0	336.0	336.0
Operator	2	8.0	336.0	672.0
Operator Trainee	2	5.0	210.0	420.0
Driver	1	3.0	126.0	126.0
Driver Trainee	1	3.0	126.0	126.0
Labor	8	2.5	105.0	840.0
DIRECT LABOR COST/WEEK			T/shs	2,520.0
B. EMBANKMENT & SURFACING				
Foreman	4		336.0	1,344.0
Operator	4		336.0	1,344.0
Operator Trainee	4		210.0	840.0
Driver	7		126.0	882.0
Driver Trainee	7		126.0	882.0
Labor	40		105.0	4,200.0
DIRECT LABOR COST/WEEK			T/shs	9,492.0
C. CULVERTS				
Foreman	1		336.0	336.0
Operator	1		336.0	336.0
Operator Trainee	1		210.0	210.0
Driver	½		126.0	63.0
Driver Trainee	½		126.0	63.0
Mason	2	6.0	252.0	504.0
Carpenter	2	6.0	252.0	504.0
Labor	8		105.0	840.0
DIRECT LABOR COST/WEEK			T/shs	2,856.0

UNIT	NO.	RATE/HR. (T/shs)	RATE/WEEK (42 HRS.)	TOTAL/WEEK
CULVERT FABRICATION				
Foreman	1		336.0	336.0
Mason	2		252.0	504.0
Labor	4		105.0	420.0
DIRECT LABOR COST/WEEK			T/shs	1,260.0
TOTAL 3(a) + 3(b) = 4,116.0				
D. FIELD SUPPORT				
Mechanical/Lub/Fuel Man	1	8.0	336.0	336.0
Mechanical Helper	1	6.0	252.0	252.0
Driver	8	3.0	126.0	1,008.0
Driver Trainee	4	3.0	126.0	504.0
Dispatcher	1	6.0	252.0	252.0
Operator	1	8.0	336.0	336.0
DIRECT COST LABOR/WEEK			T/shs	2,688.0
Prorate to Operating Units	1. Clearing & Shaping:		15% =	404
	2. Embankment & Surfacing:		80% =	2,150
	3. Culvert:		5% =	134
E. MECHANICAL WORK SHOP				
Foreman	2	8.0	336.0	672.0
Mechanic	8	8.0	336.0	2,688.0
Mechanical Trainee	8	5.0	210.0	1,680.0
Storekeeper	1	6.0	252.0	252.0
Tire Repairman	2	8.0	336.0	672.0
Welder	2	8.0	336.0	672.0
Labor	12	2.5	105.0	1,260.0
DIRECT COST LABOR/WEEK			T/shs	7,896.0
Prorate to Operating Units	1. Clearing & Shaping:		15% =	1,184
	2. Embankment & Surfacing:		80% =	6,317
	3. Culvert:		5% =	395

UNIT	NO.	RATE/HR. (T/shs)	RATE/WEEK (42 HRS.)	TOTAL/WEEK
F. SUPERVISORY SUPPORT STAFF - (LOCAL)				
Office Manager	1	8.0	336.0	336.0
Time Keeper	1	3.0	126.0	126.0
Clerk	1	3.0	126.0	126.0
Typist	1	3.0	126.0	126.0
Driver	4	3.0	126.0	504.0
Warden	4	2.5	105.0	420.0
DIRECT COST LABOR/WEEK . . . . . T/shs				1,638.0

Prorate to Operating Units
1. Clearing & Shaping: 15% = 246
2. Embankment & Surfacing: 80% = 1,310
3. Culvert, Drift: 5% = 82

TABLE VII - 24

SUMMARY: DIRECT COST/WEEK FOR EACH

FIELD REHABILITATION UNIT

A. Clearing and Shaping Unit (Average 10 km/week)

Direct Labor	T/shs	2,520	
Equipment Operation Cost		8,585	
Support Equipment Labor		404	
Workshop Labor		1,184	
Support Equipment Operation Cost		4,336	
Local Supervisory Staff.		246	
TOTAL DIRECT COST:	T/shs	17,275 =	T/shs 1,727/km

B. Embankment and Surfacing Unit (Average 6 km/week)

Direct Labor	T/shs	9,492	
Equipment Operation Cost		50,391	
Support Equipment Labor		2,150	
Workshop Labor		6,317	
Support Equipment Operating Cost		23,124	
Local Supervisory Staff		1,310	
TOTAL DIRECT COST:	T/shs	92,784 =	T/shs 15,464/km

C. Culvert, Unit (Average 40 m/week)

Direct Labor	T/shs	4,116	
Equipment Operation Cost		9,607	
Support Equipment Labor		134	
Workshop Labor		395	
Local Supervisory Staff		82	
Materials @ T.Sh. 60/meter		2,160	
TOTAL DIRECT COST:	T/shs	17,939 =	T/shs 448/meter

TABLE VII-25

SUMMARY OF UNIT COSTS OF ROAD REHABILITATION

		Weekly Cost (T/shs)	Unit Cost (T/shs)
A. Clearing & Shaping Unit (10/km/wk):			
Direct Cost		17,275	1,728/km
Overhead Cost		9,702	1,261
	TOTAL:	26,977/wk	2,989/km*
B. Embankment & Surfacing (6 km/wk):			
Direct Cost		92,786	15,464/km
Overhead Cost		51,743	11,211
	TOTAL:	144,529/wk	26,675/km
C. Culvert (40 M/wk/ -quantities vary/km-):			
Direct Cost		17,939	448/M
Overhead Cost		3,233	105
	TOTAL:	21,172/wk	553/M

NOTES: 1) The average direct cost for A & B for rehabilitation in the Arusha area as estimated by the ARVPD is $2,550/km (1979 costs), or T/shs 20,010/km.

2) TIRDEP Report of 1978 estimates the average direct cost/km for A&B of T/shs 20,481 for Local Main Roads (320 km) and T/shs 1,810/km for Feeder Roads (750 km) in Handeni District of Tonga Region.

3) The World Bank Fifth Highway Project Staff Appraisal Report of December 27, 1978, notes that road rehabilitation to all-weather standards can range from a low of $3,500 to a high of $12,500 per km.

* Assume new bridge and drift construction
Plus utilities and materials distributed over 4,336 clear and shape sq. A. = 2,989 + 2,730 = 5,719.

Total weighted average costs =
(4,336)(5,719) + (2,834)(26,675) + (553)(5,760)/4,336 = 23,888

Since only a sample of the roads under consideration were actually surveyed by the Study Team, it was necessary to estimate the number of structures required on the remaining roads. The estimates were prepared by averaging the number of structures required per unit length from observed roads in each region.

f. Contingencies and Escalation

Provision for contingencies and escalation are given in Table VII-26. Cash flow requirements are provided in Table VII-27. Backup calculations are shown in Tables VII-28 and VII-29. Costs per kilometer and production rates can be expected to vary with several factors such as weather, terrain, difficulty of working subsoil, etc. Nevertheless, the average production rate for all teams should approach the figures given in the Tables.

It must be emphasized also that the production rates assume a reasonably efficiently functioning organization. The Rehabilitation Teams will be sufficiently staffed and equipped to function largely independently and, outside of the demands of training, should not experience undue interference nor should they experience regional and district pressures to perform other work, for equipment loans, or for other requests that presently hamper the existing organizations.

TABLE VII - 26

CONTINGENCIES AND ESCALATION

ITEM	CONTINGENCY ITEM $		ESCALATION ITEM $	
Mobilization	2,165,705	920,000		
Expatriate Salaries			4,950,000	
Local Salaries				18,171,972
Fuel/Oil/Grease				34,450,224
Equipment Purchases	11,258,800			
New Bridge and Drift Construction				9,455,000
Utilities and Materials				2,380,600
TOTAL (1980 Costs)	13,424,505	920,000	4,950,000	64,457,796
Contingencies @ 10%	1,342,450	92,000		
Escalation @ 10%/Yr.				
Expatriate Salaries			487,320	
Utilities & Materials				229,277
Local Salaries				1,870,661
Fuel, Oil, Etc.				3,548,701
New Bridges, etc.				977,017
TOTAL INCREASE:	1,342,450	92,000	487,320	6,625,656
NEW TOTALS:	14,766,955	1,012,000	5,437,320	71,083,452

	$	T.Sh.
NEW TOTAL COST:	20,204,275	72,095,452
1980 COST:	18,374,505	65,377,796
TOTAL INCREASE:	1,829,770	6,717,656

REHABILITATION PROGRAM

CASH FLOW REQUIREMENT (000)

TABLE VII-27

YEAR	1ST YEAR		2ND YEAR		3RD YEAR		4TH YEAR		TOTAL		ORIGINAL TOTAL		TOTAL INCREASE	
ITEM	U.S. $	T/shs	U.S. $	T/shs	U.S. $	T/shs	U.S. $	T/shs	U.S. $	T/shs	U.S. $	T/shs	U.S. $	T/shs
Mobilization & Demobilization*	2,159.9	1,012.0	54.0		95.2		73.1		2,382.2	1,012.0	2,165.7	920.0	216.5	92.0
Equipment Purchases*	12,219.7		165.0						12,384.7		11,258.8		1,125.9	
Expatriate Salaries**	234.0		1,572.0		1,729.2		1,902.1		5,437.3		4,950.0		487.3	
Local Salaries**		68.8		6,034.4		6,637.8		7,301.6		20,042.6		18,172.0		1,870.6
Utilities & Materials**		161.8		739.[illegible]		813.6		894.9		2,609.9		2,380.6		229.3
Fuel, Oil, etc.**		108.0		11,447.4		12,592.2		13,851.3		37,998.9		34,450.2		3,548.7
New Bridges, Drifts, etc.**				3,151.7		3,466.8		3,813.5		10,432.0		9,455.0		977.0
TOTALS	14,613.6	1,350.6	1,791.0	21,373.1	1,824.4	23,510.4	1,975.2	25,861.3	20,204.2	72,095.4	18,374.5	65,377.8	1,829.7	6,717.6

TOTAL INCREASE	U.S. $	T/shs
*Contingency	1,342.4	92.0
**Escalation	487.3	6,625.5
TOTAL:	1,829.7	6,717.5

TABLE VII 28

MOBILIZATION & DEMOBILIZATION SCHEDULE

	Year 0-1 U.S.$	Year 1-2 U.S.$	Year 2-3 U.S.$	Year 3-4 U.S.$	Total U.S.$	Grand Total U.S.$
A. INTERNATIONAL TRAVEL:						
1. Air Fares						
Project Coordination Team	3,000		6,000	3,000	12,000	
Chief Highway Engineer	3,000		6,000	3,000	12,000	
Highway Engineer/Training Supervisor	3,000		6,000	3,000	12,000	
Parts/Stores Manager	2,000		4,000	2,000	8,000	
Office Manager	2,000		4,000	2,000	8,000	52,000
2. Supervision Teams						
Highway Engineer (4)		12,000	24,000	12,000	48,000	
Mechanical Superintendent (4)		8,000	16,000	8,000	32,000	
Equipment Superintendent (4)		8,000	16,000	8,000	32,000	112,000
Visas, Shots, etc.	1,625	3,500			5,125	5,125
B. PER DIEM						
1. International Per Diem						
Project Coordination	375		750	375	1,500	
Supervision Teams		900	1,800	900	3,600	5,100
In-Country Per Diem						
Project Coordination	300		600	300	1,200	
Supervision Teams		720	1,440	720	2,880	4,080
Air Freight						
Project Coordination	7,200			7,200	14,400	
Supervision Teams		16,000		16,000	32,000	46,400
Total International Travel:	22,500	49,120	86,590	66,495		224,705
+ 10% Contingency	24,750	54,032	95,249	73,144		247,175
Prefab Houses (17 each)	17 houses @ $75,000 each = $1,275,000 + 10% Contingency 127,500					1,402,500
	0-1 1,402,500					
Office Supplies & Equipment:	Est. $90,000 + 10% Contingency @ 9,000 =					99,000
Prefab. Workshops (4 each)	4 shops @ $144,000 each = $576,000 + 10% Contingency @ 57,600 =					633,600
	0-1 633,600					
TOTAL:	2,159,850	54,032	95,249	73,144		2,382,275

TABLE VII - 29

COST ESCALATION FOR REHABILITATION PROGRAM

A. Expatriate Salaries:

Coordination Team $468,000/year x 3.5 years = $1,638,000
Supervision Teams $1,104,000/year x 3 years = 3,312,000
$4,950,000

	Year 0-1 (U.S.$)	Year 1-2 (U.S.$)	Year 2-3 (U.S.$	Year 3-4 (U.S.$)	Total
Expatriate Salaries:					
Coordination Team	$234,000	$ 468,000	$ 514,800	$ 566,280	$1,783,080
Supervision Teams	---	1,104,000	1,214,400	1,335,840	3,654,240
	$234,000	$1,572,000	$1,729,200	$1,902,120	$5,437,320

Escalation = $487,320

B. Utilities, Materials, etc.:

Coordination Team	T/shs 104,000	
Utilities Per Diem	144,000	
Equipment Operation	75,600	
	323,600 x 3.5 years = T/shs	1,132,600
Supervision Teams, Utilities & Materials	416,000 x 3 years =	1,248,000
	TOTAL T/shs	2,380,600

	Year 0-1 (T/shs)	Year 1-2 (T/shs)	Year 2-3 (T/shs)	Year 3-4 (T/shs)	Total (T/shs)
Coordination Team	161,800	323,600	355,960	391,556	1,232,916
Supervision Teams	---	416,000	457,600	503,360	1,376,960
	161,800	739,600	813,560	894,916	2,609,876

Escalation = T/shs 229,276

C. Local Salaries - Field: 1,474,200 x 4 teams/year = T/shs 5,896,80
Field Salaries x 3 years = " 17,690,40
Project Coordination
Salaries 137,592 x 3.5 yrs. = 481,57

TOTAL LOCAL SALARIES: T/shs 18,171,97

	Year 0-1 (T/shs)	Year 1-2 (T/shs)	Year 2-3 (T/shs)	Year 3-4 (T/shs)	Total (T/shs)
Coordination Team	68,796	137,592	151,351	166,486	524,225
Field Salaries	---	5,896,800	6,486,480	7,135,128	19,518,408
TOTAL:	68,796	6,034,392	6,637,831	7,301,614	20,042,633

Escalation = T/shs 1,870,661

D. Fuel/Oil/etc.: Field: 2,807,880/team/year x 4 teams = 11,231,520/year x 3 years
= T/shs 33,694,560
Coordination Team: 215,904/year x 3.5 years = T/shs 755,664

TOTAL: T/shs 34,450,224

	Year 0-1	Year 1-2	Year 2-3	Year 3-4	Total
Coordination Team	107,952	215,904	237,494	261,244	822,594
Field Salaries	---	11,231,520	12,354,672	13,590,139	37,176,331
	107,952	11,447,524	12,592,166	13,851,383	37,998,925

Escalation = T/shs 3,548,701

E. New Bridges, Drifts, etc. Total Cost: T/shs 9,455,000

Average 1/3 year = T/shs 3,151,667/year

Year:	1-2	2-3	3-4	Total
	3,151,667	3,466,833	3,813,517	T/shs 10,432,017

Escalation = T/shs 977,017

F. Proposed Maintenance Program and Organization

1. Maintenance Program

a. General

As noted in Section VII E.2., all roads being considered for rehabilitation and future maintenance would be examined by the team of expatriate Engineers and Counterparts during the mobilization period. During this same period, the expatriate Engineers and Counterparts, accompanied by a permanently assigned Roads Inspector, shall select local individuals to be employed as paid "Maintenance Contractors". These contractors will be expected to provide routine maintenance for sections of each road. Routine maintenance will include vegetation control; cleaning of ditches, culverts, and drifts; and filling of potholes and surface irregularities.

Experience has indicated that one man can perform the routine maintenance for 1 to 2 kilometers per month, depending upon terrain, rainfall, etc., for an average of 1.5 kilometers per man working 12 days per month. The "Maintenance Contractors" must be selected, instructed in the performance of their duties, and provided with the necessary tools to permit them to assume the routine maintenance for each kilometer of road as completed by the rehabilitation team.

The proposed system has a number of advantages, i.e.:

(1) The Contractor is a local man and his family and friends use the road he is being paid to maintain.

(2) He is responsible for his own section and can be encouraged to take pride in its upkeep.

(3) Local road users will know the person responsible for each road section and can exert influence to make certain the road is maintained.

(4) Dependence on machines and transport is reduced to a minimum with emphasis on labor-intensive methods.

(5) The system is adaptable for eventual implementation by local authorities who lack the sophisticated support services required for machine-intensive maintenance.

(6) The system is based upon payment by results. The only supervision required would be the Roads Inspector who would inspect each road section each month and authorize payment to the Maintenance Contractor upon satisfactory performance.

For certain road sections that lie near existing villages, contracts for maintenance of nearby road segments may be parceled out to the community as a joint effort and responsibility. This is discussed in the final paragraphs of Chapter IV. This approach will only be practical where villages are within reasonable distances of the maintenance sections.

In addition to the Maintenance Contractors for routing maintenance, it will be necessary to provide surface grading and to replace surface materials at varying intervals. This periodic maintenance can be provided most efficiently by machine methods utilizing a mobile team. This team can also provide the means for extraordinary and emergency repairs and rehabilitation.

b. Unsurfaced Roads

The following maintenance activities will be scheduled:

(1) Routine maintenance performed by individual Maintenance Contractors for each 1-1/2 km, on average. The length of each contract section may vary according to terrain, rainfall, or other factors.

(2) Periodic surface grading of three times per year: before and after the rainy season, and once about mid-dry-season. This three times per year surface grading should correct "washboarding" and maintain the crown of the roadway, which is beyond the capabilities of the Maintenance Contractor. It is estimated that one grader should be able to cover about 30 kilometers per week, or on a 40 week basis, approximately 1,200 km per year. With three gradings per year, one grader would be required for each 400 km of road.

(3) Extraordinary and/or emergency maintenance or repair would be accomplished by the mobile team on an "as needed" basis.

(4) The Roads Inspector shall inspect each road section each month. He will pay each Maintenance Contractor for satisfactory performance, or, if the routine maintenance is not satisfactory, he may withhold

payment and allow the contractor one month to correct his failings. If the Contractor's performance is then satisfactory, he shall be paid for both months. If the performance is still not satisfactory, then the maintenance contract will be terminated and a new contractor selected.

The inspection team, consisting of the Roads Inspector and a recording clerk, shall, in addition to monitoring the performance of the individual Maintenance Contractors, report in writing to the Maintenance Engineer any repairs or extraordinary or emergency work noted during the monthly inspection trips. He shall estimate the labor, equipment and materials necessary to repair the noted deficiencies to permit the Maintenance Engineer to schedule the activities of the mobile team for corrective actions.

It is expected that the Roads Inspector will be able to cover a minimum of 20 kilometers per working day, or 400 km per month.

c. Roads Surfaced with Granular Material

(1) The routine maintenance activities will be essentially the same as for the earth roads, and can be performed by the same "Maintenance Contractor" system. The major difference would be the need to stockpile gravel for pothole fillings, etc., should suitable material not be available from road-side sources.

The periodic maintenance (surface grading, etc.) will be required at more frequent intervals due to the higher traffic. It is estimated that the surface grading would be required at a maximum of every two months, or six times per year, which will require one grader for each 200 kilometers of road, or two graders for each 400 km maintenance section.

(2) Resurfacing:

As a result of surfacing loss due to natural causes and the higher traffic expected on these roads, it will be necessary to replace the surfacing materials at frequent intervals. The interval may vary from four years for roads with steep gradients, high rainfall and high traffic, to eight years for roads with flat gradients, lower rainfall and lower traffic. In many areas the resurfacing material is available from adjacent roadside sources, while in other cases it may be necessary to haul the material up to ten kilometers (possibly more in Mwanga/Same Districts). For

estimating purposes, an average of five kilometers is assumed for the haul distance and should be appropriate for the roads being considered.

The mobile team would have the capability of graveling 500 lineal meters daily with a thickness of 5 cm of material (± 150 cu. meters), with 5 km haul of imported borrow, or 1 kilometer per day with roadside borrow. The average of 3/4 km per day in a 20 working days per month schedule will complete about 15 km per month, or 135 km during the nine month working season.

If regraveling is assumed to be required on an average of every 6 years, the team could resurface approximately 810 km with 5 cm of surfacing, providing their capability is not strained for extraordinary or emergency repairs. Since this team will be required to provide the extraordinary and emergency repairs as well, the production should be estimated at 540 km every 6 years to allow sufficient time for the additional work.

2. Organization and Equipment

The following organization and equipment fleet represent the ultimate needs to properly maintain all the roads in the project districts, although cost figures generated subsequently are restricted to the maintenance of rehabilitated roads only. Combined costs for the entire network are discussed in the following subsection G.

Since the maximum maintenance effort may not be required for the immediate future, a lesser frequency of surface grading and the substitution of drags, towed by small farm-type tractors or trucks, could be accepted during the interim. The available existing highway equipment, such as economically repairable trucks, graders, loaders, pick-ups, tractors, compactors, and miscellaneous items necessary for the fully operational maintenance fleet, must be inspected and returned to a usable condition during the first few years of the rehabilitation program. Since the spare parts and accessories necessary to repair this existing equipment cannot be determined until the equipment is inspected, it will be necessary that this be an early task for the workshop teams.

It is expected that the maintenance phase will be implemented during the rehabilitation program so that, upon completion of the rehabilitation, the trained teams will have assumed the maintenance responsibilities for the entire Rehabilitation Team's area of responsibility.

It is recommended that the reduced expatriate team required to supervise and assist in the maintenance program be retained from the rehabilitation group for an additional three years after completion of the three year rehabilitation program.

The expatriate team members anticipated to be included in the follow-on maintenance phase of the program are the Project Coordinator, the Highway Engineer/Training Supervisor and the Parts/Supply Manager in the Project Coordination team. The Field Supervisory group would consist of the Highway Engineer/Team Leader/Training Supervisor, the Mechnaical Superintendent and the Equipment Operation Superintendent for each Maintenance Team.

Figure VII-15 shows the proposed Maintenance Organizations. The similarit with the Rehabilitation Organization is apparent. A line of authority to the Ministry of Works will become effective during this program so that when the expatriates are phased out of the maintenance program, the Ministry of Works Roads Maintenance Engineer will be firmly in control.

The Study Team firmly believes that the Maintenance Organizations must remain beyond the control of the district and regional officials. This is to insure that the organization and its resources do not become dispersed to other duties, and the highway investment lost.

The Maintenance Unit organization is given in Figure VII-16 and the additional maintenance equipment required is shown in Table VII-30 for the entire road network in the project districts. As can be seen, the major equipment requirements will be in graders, dump trucks, and pick-ups. Grader requirements may be temporarily excessive, since it may be that present conditions may not require the ultimate grading effort assumed. Traffic and rainfall may be such that only half the frequency of grading passes will be necessary. If so, only 6 or 7 additional graders may suffice. In the early maintenance stages, tractor-drawn drags may prove totally adequate for some of the grading functions, further reducing the number required. The Study Team is confident that present equipment can be repaired and made serviceable to meet most of the maintenance equipment needs.

The required maintenance personnel are listed in Table VII-31. Again, the numbers of operators and operator trainees may be temporarily excessive. The figures shown are based on the frequent gradings assumed. If the frequency is reduced by half, this number would also be reduced. However, it should be

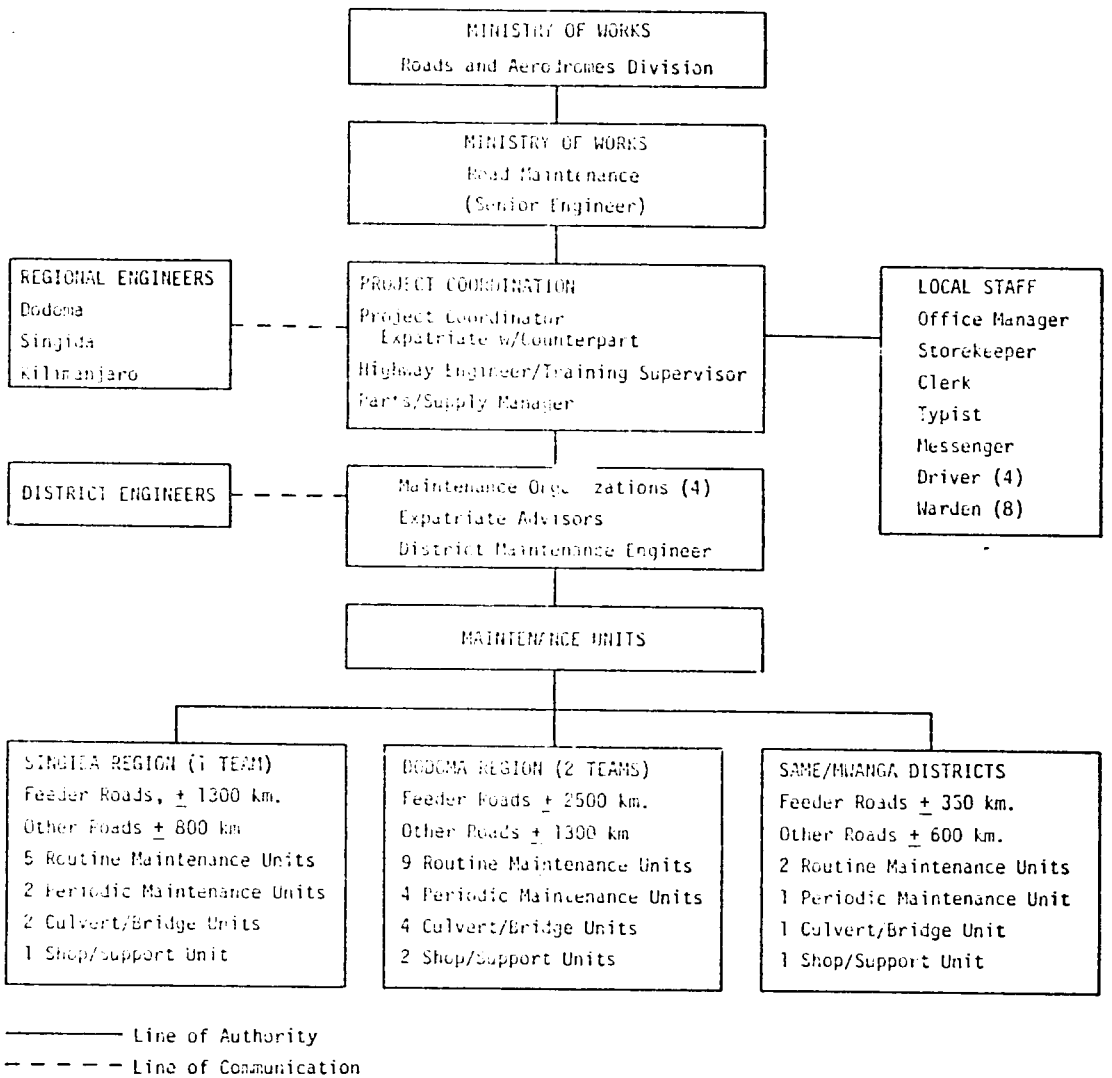


FIGURE VII - 15

MAINTENANCE ORGANIZATION TEAMS

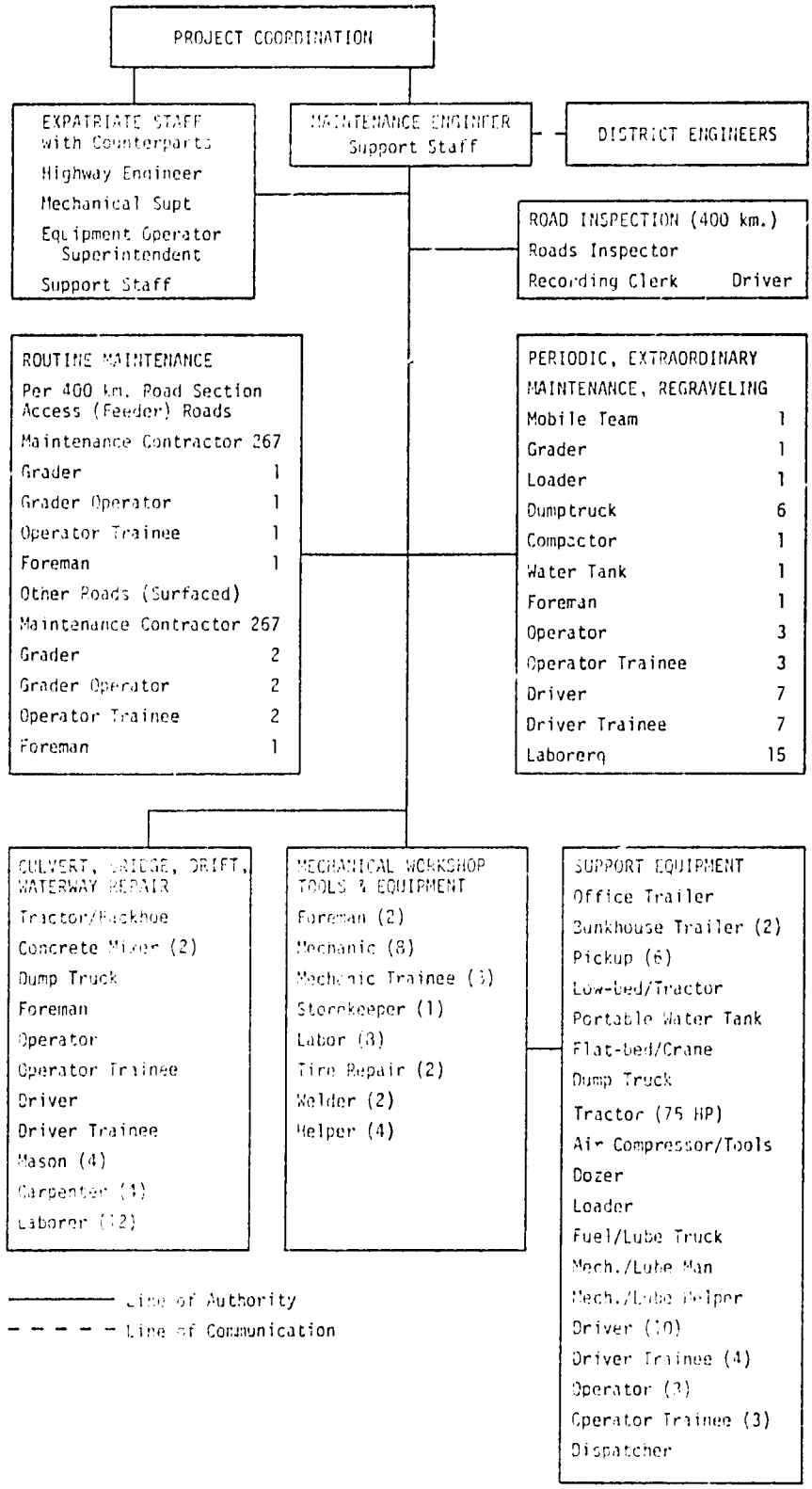


FIGURE VII-16

MAINTENANCE TEAM

TABLE VII-30

ADDITIONAL MAINTENANCE EQUIPMENT REQUIREMENTS

	Dodoma Maintenance Team (3,829 km) 9 Routine Units 4 Periodic Units					Singida Maintenance Team (2,253 km) 5 Routine Units 2 Periodic Units					Same/Mwanga Team (1,013 km) 2 Routine Units 1 Periodic Unit							
MAINTENANCE EQUIPMENT REQUIRED	Routine Maint.	Periodic Maint.	Culvert & Bridge	Mech. Workshop	Support	Routine Maint.	Periodic Maint.	Culvert & Bridge	Mech. Workshop	Support	Routine Maint.	Periodic Maint.	Culvert & Bridge	Mech. Workshop	Support	TOTAL	Prov. Under Rehab. Prog.	Balance* Required
Grader	12	4				7	2				3	1				29	8	21
Loader		4			2		2			1		1			1	11	8	3
Dump Truck		24			2		12			1		6			1	46	32	14
Compactor		4					2					1				7	4	3
Water Tanker		4					2					1				7	4	3
Office Trailer					2					1					1	4	4	0
Bunk House Trailer					4					2					2	8	8	0
Pick-Up					12					6					6	24	16	8
Lowbed/Tractor					2					1					1	4	2	2
Portable Water Tank					2					1					1	4	4	0
Flatbed/Crane					2					1					1	4	4	0
Tractor (80 HP)					2					1					1	4	4	0
Air Compressor/Tools					2					1					1	4	4	0
Dozer					2					1					1	4	4	0
Concr. Mixer			4					2					1			7	8	0
Tractor/Backhoe			2					1					1			4	4	0
Workshop Equip.				2					1					1		4	4	0
Fuel/Lube Truck					2					1					1	4	4	0

Note: The balance of equipment required for maintenance not purchased under the rehabilitation program may be obtained from the existing fleet in the Regions. This equipment must be repaired during the early stages of the rehabilitation program so that it will be in good operating condition to assume the maintenance activities upon completion of rehabilitation of each road section.

TABLE VII-31

REQUIRED MAINTENANCE PERSONNEL
FOR TOTAL NETWORK

Type Personnel	Dodoma District	Singida District	Same/Mwanga Districts	Total
Operators	34	19	11	64
Oper. Trainees	34	19	11	64
Drivers	57	28	19	104
Driver Trainees	57	28	19	104
Foremen	20	11	6	37
Mason	16	8	4	28
Carpenter	16	8	4	28
Mason, Carp. Trainees	32	16	8	56
Mechanic	16	8	8	32
Mechanic Trainee	16	8	8	32
Storekeeper	2	1	1	4
Tire Repair Man	4	2	2	8
Welder	4	2	2	8
Tire/Welder Trainee	8	4	4	16
Mech./Lube Man	2	1	1	4
Mech./Lube Trainee	2	1	1	4
Dispatcher	2	1	1	4
Labor	60	30	15	105
Roads Inspector	9	5	2	16
Recording Clerk	9	5	2	16
Maintenance Cont.	2530	1400	630	4560

possible to train this number (64) of operators during the rehabilitation program. The other personnel requirements also should be met with individuals that were trained during the rehabilitation program.

3. Training

The training programs that were initiated during the rehabilitation program will be continued. The individuals that were trained and certified will be promoted to higher positions and either be retained for the maintenance program, or be transferred to available positions within the district and regional organizations. The Project Coordinator and Training Supervisor will decide which trainee will be transferred after certification and which will be retained for the maintenance program.

The same training effort and materials from the rehabilitation program will be continued during the on going maintenance program. The maintenance organization on Figure VII-15 indicates the Highway Engineer/Training Supervisor positions will remain.

4. Maintenance Costs

The direct routine maintenance costs are estimated in Table VII-32. The cost for unsurfaced roads is T/shs 4860/km/year. The essential difference for routine maintenance between the unsurfaced roads, and the roads surfaced with granular material, will be the frequency of grading and need for stockpiling surfacing materials for use by the Maintenance Contractors (pothole filling, etc.), which add T/shs 2,100/km/yr to the maintenance costs.

The estimated cost for regraveling of the roads, based upon a production rate of 15 km/month, is calculated in Table VII-33. This figure is T/shs 13,698/km.

Direct support cost are provided in Table VII-34. Yearly overhead costs are given in Table VII-35 and average T/shs 2,947/km/year.

Total annual maintenance cost for the rehabilitated roads is calculated in Table VII-36. For the 4,336 km of roads, this amount is T/shs 50,168,300 or an approximate average cost of T/shs 11,600 km/year. Of this, the overhead cost is only about T/shs 2,900 km/year. The remainder, or T/shs. 8,900 km/year, represents what should be spent to maintain the roads properly. These figures are based on frequent maintenance operations, and savings, perhaps substantial, may be achieved by close monitoring of road performance and

condition. If grading operations are reduced by 1/3 to 1/2, approximately T/shs 6,600,000 would be saved.

It is considered essential that these maintenance teams be continued for the three-year period given in the program for three reasons:

First, the organization must retain its independence and its resources. The only practical means of doing this is under expatriate direction, which could be phased out to the Ministry of Works' Maintenance Engineer during the three year period. If this independence is lost, it is likely that the organizational resources will be dispersed and the maintenance effort largely curtailed. The rehabilitation investment and effort would be wasted.

Secondly, training would be continued under a uniform, consistent basis applied strictly to roadway maintenance and rehabilitation efforts. While greater numbers of trained individuals than are probably required in the project districts would result, the excess would be quickly absorbed by other districts. Consistency in the training program with evaluation and certification is considered extremely important.

Finally, the direction of the project coordination team would guarantee the proper level of maintenance to suit the conditions that will prevail after rehabilitation. This maintenance effort will be phased in during the rehabilitation phase. After this program has been completed, all efforts will be concentrated on maintenance and the proper level that should be applied to suit the traffic, terrain, rainfall and soil conditions that prevail. A further three years of guidance and direction in this maintenance effort should inculcate proper maintenance practices into a functioning ongoing organization.

TABLE VII-32

ROUTINE MAINTENANCE

DIRECT COST

	T/shs Per km/month
A. Unsurfaced Roads	
1. Maintenance Contractor (1.5 km/mo.) T/shs 300/mo. ÷ 1.5 km/mo. =	200
2. Hand Tools for Maintenance Contractor (18 mo. life) T/shs 1,000 ÷ 18 mo. = T/shs 56/mo T/shs 56/mo. ÷ 1.5 km/mo =	37
3. Inspection Team (400 km/mo.) Roads Inspector @ T/shs 1,660/mo. Recording Clerk @ T/shs 640/mo. Driver @ T/shs 640/mo. TOTAL = T/shs 2,940/mo. T/shs 2,940/mo ÷ 400 km/mo. =	8
4. Transport for Inspection Team (400 km/mo.) Pick-up @ T/shs 4,543/mo. T/shs 4,543/mo ÷ 400 km/mo. =	12
5. Grader (120 km/mo.) Operating Cost @ T/shs 16,149/mo. Operator @ T/shs 1,660/mo. TOTAL = T/shs 17,809/mo T/shs 17,809/mo ÷ 120 km/mo. =	148
TOTAL DIRECT COST, Unsurfaced Roads	T/shs 405/km/mo. T/shs 4,860/km/year

B. Roads Surfaced with Granular Material

1. Estimated 8 cu.m. (two truck loads) of surfacing stockpiled two times per year for Maintenance Contractor Cost per Km:

Dump truck	2 hrs	@ T/shs	127/hr.	= T/shs	254/km
Loader	1 hr	@ T/shs	38/hr.	= T/shs	38/km
Operator	1 hr	@ T/shs	8/hr.	= T/shs	8/km
Oper. Trainee	1 hr	@ T/shs	5/hr.	= T/shs	5/km
Driver	2 hr	@ T/shs	5/hr.	= T/shs	10/km
Driver Trainee	2 hrs	@ T/shs	3/hr.	= T/shs	6/km

Cost/KM . . . . . .T/shs 321/year
Cost/KM . . . . . .T/shs 27/km/mo.

2. Surface grading would be required about 6 times/year (for the unsurfaced roads) or 2 x T/shs 148/km - 296/km.

The estimated direct cost for maintaining the roads surfaced with granular material would be:

		T/shs Per km/mo.
a.	Maintenance Contractor	200
b.	Hand Tools for Maint. Contractor	37
c.	Inspection Team	8
d.	Transport for Insp. Team	12
e.	Grading	296
f.	Stockpiling Gravel	27
	TOTAL DIRECT COST	T/shs 580/km/mo. T/shs 6,960/km/yr.

TABLE VII-33

REGRAVELING COST

A. Equipment Operating Cost:

Unit	No.	Unit Cost/ Hr. T/shs	Total Cost/Hr. T/shs	Cost/Mo. (@140 Hr./Mo.) T/shs
Grader	1	103.60	103.60	14,504
Loader	1	75.04	75.04	10,506
Dump Truck	6	127.28	763.68	106,915
Compactor	1	158.80	158.80	22,232
Water Truck	1	127.28	127.28	17,819

SUBTOTAL: Equipment Direct Cost/Mo. T/shs 171,976/Mo.
T/shs 171,976/Mo. ÷ 15 km/mo. = T/shs 11,465/km.

B. Labor:

Unit	No.	Unit Cost/ Hr. T/shs	Total Cost/Hr. T/shs	Cost/Mo. (@210 Hr./Mo.) T/shs
Foreman	2	8	16	3,360
Operator	3	8	24	5,040
Operator Trainee	3	5	15	3,150
Driver	7	3	21	4,410
Driver Trainee	7	3	21	4,410
Labor	25	2.5	62.5	13,125

SUBTOTAL: Labor Direct Cost = T/shs 33,495/mo.
T/shs 33,495/mo. ÷ 15 km/mo. = T/shs 2,233/km.

TOTAL DIRECT COST/KM FOR REGRAVELING: = T/shs 13,698/km

TABLE VII-34

DIRECT SUPPORT COST

A. Each Maintenance District	Cost/Week (T/shs) Labor	Equip.	Total
Culvert, Drift, Bridge, Repair Unit	4,116	9,607	13,723
Field Support Unit (From B. Below)	5,250	37,407	42,657
Mechanical Shop	7,896	-	7,896
Supervisory Support Staff (local)	1,638	-	1,638
TOTAL DIRECT COST (T/shs)	18,900	47,014	65,914/Wk

B. Field Support Unit Operating Cost Breakdown

1. Labor Cost

Labor	No.	Rate/Wk (T/shs)	Total/Wk (T/shs)
Operator	3	336	1,008
Operator Trainee	3	210	630
Driver	11	126	1,386
Driver Trainee	11	126	1,386
Mech./Lube Man	1	336	336
Mech. Helper	1	252	252
Dispatcher	1	252	252

LABOR, DIRECT COST T/shs 5,250/Wk

2. Equipment Cost

Equipment	No.	Rate/Hr. (T/shs)	Cost/Hr. (T/shs)	Hrs./Wk	Total (T/shs)
Bunkhouse Trailer	2	10.00	20.00	24	480
Office Trailer	1	10.00	10.00	24	240
Fuel/Lube/Mech. Truck	1	127.92	127.92	48	6,140
Pick-Up	6	21.84	131.04	48	6,290
Lowbed/Tractor	1	137.68	137.68	24	3,304
Portable Water Tank	1	10.00	10.00	24	240
Flatbed/Crane	1	128.48	128.48	24	3,083
Dump Truck	1	127.28	127.28	48	6,109
Tractor (80 hp)	1	44.88	44.88	24	1,077
Air Compressor/Tools	1	119.20	119.20	18	2,146
Fuel Trailer	1	50.00	50.00	48	2,400
Loader, Track	1	108.24	108.24	24	2,598
Dozer	1	137.52	137.52	24	3,300

EQUIPMENT DIRECT COST . . . . . T/shs 37,407/Wk

TABLE VII-35

YEARLY OVERHEAD COST

A. Coordination Team	U.S. $ Per Mo.	U.S. $ Per Yr.	(T/shs) Per Mo.	(T/shs) Per Yr.
1. Salaries: (Expatriate)				
Project Coordinator	8,500	102,000		
Highway Engineer/ Training Supervisor	8,000	96,000		
Parts/Supply Manager	7,000	84,000		
2. Home Leave, (Expatriate) 8 R.T.@$2,000/R.T.		16,000		
Int'l. per diem 6 @ 75.00		450		
3. Utilities				
3 houses @ T/shs 1,200/mo. each			3,600	43,200
4. Support Staff @ 2,646/Wk				137,592
5. Per diem (Expatriate)				
15 days/Mo. @ 400/day			6,000	72,000
6. Vehicle Operation				
3 @ 4,543/mo. each			13,630	163,560
7. Office Supplies				
@ 400/wk			1,730	20,800
TOTAL:	U.S.$298,450			T/shs 437,152

Total in T/shs:
U.S. $298,450 x T/shs 8/U.S.$ = T/shs 2,387,600
Total = T/shs 2,824,752
25% to each Team = 2,824,752 x 0.25 = T/shs 706,188/team

TABLE VII-35 (continued)

B. Maintenance Supervision

	U.S. $ Per Month	U.S. $ Per Year	T/shs Per Month	T/shs Per Year
1. Salaries, Expatriate				
Highway Engineer/Team Leader	8,000	96,000		
Mechanical Superintendent	7,500	90,000		
Equipment Operation Superintendent	7,500	90,000		
2. Home/Leave (Expatriate)				
7 R.T. @ $2,000/R.T.		14,000		
Int'l Per diem, 6 @ $75.00		450		
3. Utilities				
3 houses @ 1,200/mo. each			3,600	43,200
1 shop @ 800/wk			3,467	41,600
4. Office & Field Supplies				
@ $600/wk			2,600	31,200
Per Maintenance Supervision		U.S.$290,450		T/shs 116,000
Total in T.Sh. U.S. $290,450 x T/shs 8/US$=			T/shs	2,323,600
Total =			T/shs	2,439,600

C. Total Cost, Overhead/Year

Coordination Team =		T/shs 2,824,752
Maintenance Supervision Team (4 x 2,439,600 ea.)	=	T/shs 9,758,400
TOTAL =		T/shs 12,583,152

D. Km to be maintained:

	Unsurfaced	Surfaced	Total
1. Dodoma Region	689	1,589	2,278
2. Singida Region	580	795	1,375
3. Same/Mwanga Districts	233	450	683
Total Km.:	1,502	2,834	4,336

E. Average Overhead Cost/Km/Yr

T.Sh. 12,583.152 ÷ 4,336 km = T/shs 2,902/km/yr.

TABLE VII-36

ANNUAL COST OF MAINTENANCE (4,336 Km)

Rehabilitated Roads Only

	No.	Ave. Cost/ km/year (T/shs)	Total Cost (T/shs)	Total Cost/Year (T/shs)
1. Dodoma Region				
Routine Maintenance Unsurfaced Roads	689	4,860	3,348,540	
Surfaced Roads	1,589	6,960	11,059,440	
Periodic Maintenance (2 units)	270	13,698	3,698,460	
Support Cost (2 units)			1,581,936	
Overhead (Supervision 2 units)			4,879,200	
Overhead (Coordination Team 50%)			1,412,400	26,828,300
2. Singida Region				
Routine Maintenance Unsurfaced Roads	580	4,860	2,818,800	
Surfaced Roads	795	6,960	5,533,200	
Periodic Maintenance	135	13,698	1,849,230	
Support Cost (1 unit)			790,968	
Overhead (Supervision)			2,439,600	
Overhead (Coordination Team) @ 25%)			706,188	26,828,300
3. Same/Mwanga Districts				
Routine Maintenance Unsurfaced Roads	233	4,860	1,132,380	
Surfaced Roads	450	6,960	3,132,000	
Periodic Maintenance	135	13,698	1,849,000	
Support Cost (1 unit)			790,968	
Overhead (Supervision)			2,439,600	
Overhead (Project Coordination @ 25%)			706,188	10,050,366
TOTAL COST . . . . . T/shs				50,168,304

G. Financial Analysis

1. Recent Road Maintenance Budgets

During the early 1970's major expenditures were made on the Tan-Zam Highway and, following its completion in 1974, on the Trunk Road between Mtwara and Masaii and the industrial road between Dar-es-Salaam and the International Airport. In 1978, construction was started on two other rural Trunk Roads and the new access road between the port of Dar es Salaam and its major connecting roads. Expenditures on Trunk Roads and Bridges through FY 1977/78 (T/shs millions) has been as follows:

	1973/74	1974/75	1975/76	1976/77	1977/78
Recurrent	36.6	30.3	34.3	103.8	112.1
Development	94.6	143.7	170.8	145.4	123.0

Recurrent expenditures represent maintenance funds while development expenditures represent road construction allocations.

Since decentralization in 1973, the Government's emphasis has been shifting to rural development, including feeder road construction. The roads budget in Table VII - 37 has been extracted from the recently published FY 1980/81 Budget and is presented for a matter of information. It does not include Trunk Road Expenditures.

Highway inventories indicate that there are about 45,000 km of highways in Tanzania. Of this 45,000 km, 9,316 km are classified as Trunk Roads and the balance, or 35,684 km, are classed as Secondary and Tertiary Roads. Feeder Roads are not included.

Assuming the minimum present allocation of an average of T/shs 1,200/km for routine maintenance activities (which is considered totally inadequate), the Secondary and Tertiary Roads would require a budget allocation of T/shs 42,840,000 per year, or almost double what is now being provided.

a. Revenues from Road Users

Local expenditures on roads are financed from general revenues to which road users contribute through taxes on vehicle ownership and use, including ferry charges reproduced in Table VII - 38. About 85% of total revenues from road users comes from import duty revenues. In 1976/77 total revenues from road users were sufficient to cover almost all recurrent expenditures on all roads. That is not to say that such revenues are sufficient to cover what should be spent. It does illustrate that revenues that should be applied to roads are diverted elsewhere.

TABLE VII - 37

MINISTRY OF WORKS - ROADS BUDGET - (T/shs 000)

Consolidated Fund Services
Vote 48: Ministry of Works
FY 1976/77 - 1980/81
3900 - Roads

	FY 1976/77 (Actual)	FY 1977/78 1977/78 (Est.)	FY 1977/78 1977/78 (Actual)	FY 1978/79 78/79 Bud. (Est.)	FY 1978/79 78/79 Bud. (Est.)	FY 1979/80 79/80 Bud. (Est.)	FY 1979/80 79/80 Bud. (Est.)	FY 1980 80/81 B (Est.)
Sub Items								
3902 Maintenance of Roads & Bridges	13,299.4	24,302.0	17,503.6	22,849.5	22,849.5	26,732.2	22,596.6	28,920.
3903 Road Camps	57.8	50.0	76.3	10.0	10.0	11.0	10.0	1,500.
3906 Abnormal Storm Damage	14.4	-	0.1	0.1	0.1	0.1	7,000.0	0.
3910 Reconstruction and Minor Improvement	71,397.9	75,250.0	70,306.9	75,282.0	75,282.0	85,900.0	75,282.0	80,000.
SUB-TOTAL: 3900	84,769.5	99,602.0	87,886.9	98,141.6	98,141.6	112,643.0	104,887.6	110,420.
Sub Vote 286								
Roads and Aerodromes								
1101 Personal Emoluments	22,952.4	25,217.9	25,851.2	24,948.0	24,948.0	33,000.0	23,647.0	45,000.
Maintenance and Running Expenses								
1402 Plant, Vehicles, Craft	55.1	150.0	131.7	267.3	267.3	330.0	250.0	300.
1405 Machinery and Equipment	4.9	15.0	5.1	15.0	15.0	16.5	15.0	50.
Replacements								
1702 Plant, Vehicles, Craft	5,145.6	6,200.0	12,077.5	5,890.0	5,890.0	6,820.0	12,389.0	8,820.
SUB-TOTAL: 286	28,158.0	31,582.9	38,065.5	31,120.3	31,120.3	40,166.5	36,301.0	54,170.
TOTAL: 3900 + 286	112,927.5	131,184.9	125,952.4	129,261.9	129,261.9	152,809.8	141,188.6	164,590.
TOTAL VOTE 48 (Ministry of Works)					235,465.4		242,230.0	

TABLE VII - 38

ANNUAL REVENUES

	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/7
			(T/shs million)				
Vehicle Registration Tax	19.4	7.3	7.9	9.9	1.7	0.4	0.6
Vehicle Licenses	25.3	23.2	28.6	5.5	6.1	5.8	4.8
Tax on Vehicle Transfer	2.3	1.8	5.7	5.7	7.7	6.0	6.0
Transport Licensing	3.4	3.1	4.7	5.1	11.5	10.3	8.5
Ferry Receipts 1/	1.6	1.8	-	-	-	-	-
Import Duties on Fuel, Tires, Tubes, and Vehicles	112.8	106.2	118.7	149.4	154.1	145.9	166.1
TOTAL	164.8	143.4	165.6	175.6	181.1	168.4	186.1

b. Recent Estimates for Highway Maintenance

Estimates for highway maintenance are determined on a per kilometer basis and can vary from a low of 600 T/shs/km. to as much as T/shs 1,200-1,400/km for the more important Regional and District roads. However, the funds finally issued to the respective regions and districts are limited by the availability of budget. Even after allocation, these maintenance funds can be further reduced by diversion to other needs by Regional or District authorities.

Since funds for the various sections of District COMWORKS are given under one vote, and since some of the funds can be spent by Regional COMWORKS, it is almost impossible to reconstruct the actual amounts made available for maintenance of roads in any particular District, or even Region.

In general, it can be deduced that what funds are spent on maintenance of roads is totally inadequate. A study made of the Handeni District of Tanga Regiona indicated an annual expenditure of T/shs 600, 640 and 413 (FY 1973/74, 1974/75, 1975/76) per km. The same study indicates that an average annual direct cost expenditure (without overhead or equipment depreciation) of T/shs 1,092 would be a more realistic

1/ Ferry receipts ceased in 1973.
Sources: World Staff Appraisal Report, 1978
Ministry of Finance and Planning, 1978

funding. If overheads and general expenses are included, the same study estimates an average annual routine maintenance cost of T/shs 1,493/km at that time (1977), not including periodic or regraveling costs. This estimate is believed to be much too low to provide a complete routine maintenance program with proper supervision and monitoring. It is basically an equipment-oriented operation (i.e., only 60 laborers for 870 km of roads are included), and does not provide for the continual vegetation control, ditch and culvert cleaning, pot hole filling, and other daily tasks necessary for the routine maintenance activity.

2. Cost to Maintain Rehabilitated Roads

The roads being considered for rehabilitation and follow-on maintenance are summarized in Table VII - 39.

TABLE VII - 39

SUMMARY OF REHABILITATION EFFORT

Maintenance Team	Scheduled Program 1st year	2nd year	3rd year	Rehabilitation Clear/Shape (KM)	Surf. (KM)	Total In District (KM)	Total Not Rehab. (KM)
Dodoma (South)						3,829 (S+N)	1,551 (S+N)
Clear & Shape	407	362	359	1,128			
Surface	273	257	265		795		
Dodoma (North)							
Clear & Shape	382	403	365	1,150			
Surface	263	270	261		794		
Singida						2,253	878
Clear & Shape	440	414	521	1,375			
Surface	265	265	265		795		
Same/Mwanga Districts						1,013	330
Clear & Shape	212	241	230	683			
Surface	150	160	140		450		
TOTAL:				4,336	2,834	7,095	2,759
Total/Year (KM)							
Clear & Shape	1,441	1,420	1,475	4,336			
Surface	951	952	931				
Clear & Shape Only:	490	468	544	1,502			

Routine maintenance should begin immediately upon completion of rehabilitation of each section of road.

The annual direct cost for routine maintenance for unsurfaced roads is estimated to be as follows:

	Clear and Shape Per Year (KM)	Average(KM)	Cumulative Average (KM) Routine Maint.	Cost At T/shs 4860/KM/Year
1st year	490	245	245	1,190,700
2nd year	468	234	724	3,518,640
3rd year	544	272	1,230	5,977,800
Begin 4th year	1,502			7,299,720

The average number of km represents one half of the total in the first column while the cumulative average represents this amount plus the total for the preceding years.

Direct costs to provide the recommended maintenance level for the roads being considered should therefore be budgeted at the rate shown in Table VII - 40.

TABLE VII - 40

REQUIRED MAINTENANCE BUDGET

Year	Annual Routine Maint. Unsurfaced Roads	Surfaced Roads	Total Routine Maintenance(T/shs)	Regraveling	Total Maintenance(T
1	1,190,700	3,306,000	4,496,700		4,496,700
2	3,518,640	9,931,920	13,450,560		13,450,560
3	5,977,800	16,481,280	22,459,080		22,459,080
4	7,299,720	19,724,640	27,024,360		27,024,360
5			27,024,360	7,396,900	34,421,260
6					34,421,260
7					34,421,260
8					34,421,260
9					34,421,260
10	7,299,720	19,724,640	27,024,360	7,396,900	34,421,260

1/ Unescalated costs.

The balance of the project roads that are not being actively rehabilitated each year must be maintained at a minimum level. Assuming the present budgeting practice of about T/shs 1,200/km/year is the absolute minimum which can be accepted, the maintenance direct cost for the balance of the project roads during the rehabilitation program is estimated to be:

	a. KM	b. Average	c. Year Average (km) To Be Maintained
Total Project Roads:	(1) 4,336		a (1) - b
Rehabilitate 1st year	(2) 1,441	720	3,616
Balance end 1st year:	(3) 2,895		
Balance end 1st year	(1) 2,895		
Rehabilitate 2nd year	(2) 1,420	710	2,185
Balance end 2nd year:	(3) 1,475		
Balance end 2nd year	(1) 1,475		
Rehabilitate 3rd year	(2) 1,475	738	738
Balance end 3rd year:	(3) -0-		

Cost during the rehabilitation period: (unescalated)

Year	Km to be Maintained	Cost T/shs 1200/km/year
1st	3,616	4,339,200
2nd	2,185	2,622,000
3rd	738	885,600

3. Cost to Maintain Other Roads

Other roads not included in the rehabilitation program should receive the same degree of routine maintenance as given to the rehabilitated (unsurfaced) roads of the program.

It is estimated that there are approximately 7,095 km of roads in the program Region 5, of which 4,336 will be subject to rehabilitation. The balance of the existing roads or 2,759 km., should therefore, be maintained at the routine maintenance direct cost of T/shs 4,860/km/year, for an ultimate annual total cost of T/shs 13,408,740/year. This will of necessity

require some rehabilitation before effective maintenance can be performed, which will be within the purview of the maintenance teams.

It is unreasonable to assume that full routine maintenance could be implemented from year one, but could be fully activated by year five. The first four years could be used to phase in the maintenance program, beginning with the present maintenance allocation of T/shs 1,200/km/year for the first year and, by the beginning of the fifth year, be fully operational at an annual direct cost of T/shs 4,860/km/year.

The annual direct cost for maintaining those other roads (2,759 km): (unescalated)

Year	Rate/km (T/shs)	Total/Year (T/shs)
1	1,200	3,310,800
2	2,100	5,793,900
3	3,000	8,277,000
4	3,900	10,760,100
5 to 10	4,860	13,408,740

The summary of the estimated direct maintenance cost for all the roads exclusive of Trunk Roads are given in Table VII - 41.

TABLE VII - 41

Year	Annual Direct Cost(T/shs) Rehabilitated Roads	Maintenance during Construction	All Other Roads	Total Direct Maintenance Cost/Yr.
1	4,496,700	4,339,200	3,310,800	12,146,700
2	13,450,560	2,622,000	5,793,900	21,866,460
3	22,459,080	885,600	8,277,000	31,621,680
4	27,024,360		10,760,100	37,784,460
5	34,421,260		13,408,740	47,830,000
6				
7				
8				
9				
10	34,421,260		13,408,740	47,830,000

1/ Unescalated Costs.

TABLE VII - 42

OVERHEAD AND SUPPORT COSTS

Overhead Cost for Expatriates Per Year (Coordination Team)	U.S. $	T/shs	
Salaries	282,000		
Leave and Per Diem	16,450		
Utilities		43,200	
In-Country Per Diem		72,000	
SUBTOTAL	U.S. $ 298,450	T/shs 115,200	
Field Supervision Team (4 Teams)			
Salaries: ($276,000 x 4)	1,104,000		
Leave & Per Diem: $14,450 x 4)	57,800		
Utilities: (T/shs $43,200 x 4)		172,800	
SUBTOTAL:	U.S. $1,161,800	T/shs 172,800	
TOTAL:	U.S. $1,460,250/yr.	T/shs 288,000/yr.	
Other Overhead Cost Per Year			
Project Coordination (1 Team)			
Support Staff		T/shs 137,592	
Vehicle Operation		163,560	
Office Supplies		20,800	
SUBTOTAL:			T/shs 321,952
Field Supervision Team (4 Teams)			
Utilities for Shop (T/shs 41,600 x 4):		T/shs 166,400	
Office & Field Supplies (T/shs 31,200 x 4):		124,800	
SUBTOTAL:			T/shs 291,200
TOTAL:			T/shs 613,152/yr.
Support Cost (Section E.4) =			T/shs 790,968/yr.

TABLE VII - 42

OVERHEAD AND SUPPORT COSTS

(CONTINUED)

Summary: Overhead and Support Costs

Year	Foreign U.S. $ =	Equiv. T/shs	Local T/shs	Support T/shs	Total T/shs
4	1,460,250	11,682,000	613,150	790,970	13,086,120
5	1,460,250	11,682,000	613,150	790,970	13,086,120
6	1,460,250	11,682,000	613,150	790,970	13,086,120
7			613,150	790,970	1,404,120
8			613,150	790,970	1,404,120
9			613,150	790,970	1,404,120
10			613,150	790,970	1,404,120

TABLE VII - 43

SUMMARY MAINTENANCE COSTS ALL ROADS PER YEAR 1/

Year	Direct Cost (T/shs)	Overhead and Support Cost (T/shs)	Total T/shs
1	12,146,700	---	12,146,700
2	21,854,460	---	21,866,460
3	31,608,480	---	31,621,680
4	37,784,460	13,086,120	50,870,580
5	47,830,000	13,086,120	60,916,120
6	47,830,000	13,086,120	60,916,120
7	47,830,000	1,404,120	49,234,120
8	47,830,000	1,404,120	49,234,120
9	47,830,000	1,404,120	49,234,120
10	47,830,000	1,404,120	49,234,120

1/ Unescalated Costs.

4. Overhead and Support Costs

It is anticipated that the maintenance activities could be administered by the Rehabilitation Teams and no charges should be assessed against the maintenance operation during the three years of the Rehabilitation program. Charges should be made for the anticipated three-year follow-on maintenance program only for the expatriates retained on the project. These costs, which are based on the amounts given in Table VII - 35, are provided in Table VII - 4

A summary of the total maintenance costs for 10 years is listed in Table VII - 43. Maintenance costs increase to 31,621,680 T/shs in the third year and increase further to 60,916,120 T/shs for the fifth and sixth years to cover the cost of the expatriate supervision for the follow-on maintenance program. This then reduces to 49,234,120 T/shs for the next four years, without provisions for escalation.

5. Government Financial Capabilities

The funds to maintain all the roads, except the Trunk Roads, in Dodoma and Singida Regions, and Mwanga and Same Districts, to an acceptable level of maintenance will be approximately T/shs 49,200,000 after the rehabilitation and supervision maintenance programs have been completed.

Table VII-38 shows that about 186,000 T/shs were collected as revenues as revenues from road users in 1976/77. This figure will probably exceed 200,000,000 by 1980/81. It appears that another 60,000,000 or more could be raised if registration and license fees were reviewed. Vehicles of parastatals and cooperatives or other quasi-government agencies pay no registration and licensing fees. Since vehicles from these agencies form a substantial percentage of the vehicles using the road system, these fees should be imposed for more equitable cost distribution.

If the adjusted total revenues of T/sh 260,000,000 were allocated strictly to highway maintenance, it would amount to about T/sh 5,800 per Km for the entire 45,000 Km highway network. This amounts to about 84% of the recommended allocation. The balance required, or about T/sh 1100/Km/yr could be realized by the villages and Government sharing the cost of the maintenance workers. The Government could contribute cash and the villages either cash or labor.

Part of the maintenance and repair costs of the trunk roads could be raised by the imposition of tolls or surcharges. Maintenance costs for these major arteries should be about 25% greater than the

maintenance costs for the secondary and tertiary roads. This would amount to an additional T/sh 1,750/Km/yr or T/sh 16,300,000/yr for the 9,316 Km of trunk roads. Assuming the approximately 13,000 trucks within the country use the truck roads with equal frequency, annual tolls per truck would have to be T/sh 1,250.

Since tolls would be difficult to collect and the requirement for toll takers, etc., the direct surcharge at the time of licensing should be the easiest method of collecting the needed revenue.

Action must be taken by the Government to assure that all road related revenues are allocated to the roads for the intended purpose and not diverted to other activities. This is critical as the financial capability of the Government to fund future maintenance is a significant issue.

Highways benefit almost all citizens whether they are users or not. The farmers and truckers are not the only obvious examples. Social benefits have been described that improve the quality of life for the people served by maintained roads. Reduction in vehicle operating costs and freight rates should result in lower prices. Increased employment has been mentioned as a further benefit. Many other examples could be cited.

The needs for funds in other agencies, as acute as they may be, should not obscure the importance of roads in national development.

VIII

VIII. FEASIBILITY ANALYSIS

A. Introduction

The feasibility analysis presented in this section of the report is a modified version of the producer surplus approach and is generally limited in its application to the overall project. The real data limitations of this project, coupled with the manpower, financial and time constraints prohibited the adaptation of a more detailed analysis. The question has also been raised concerning the appropriateness of adapting a full package producer-surplus analysis to Tanzania. For example, Professor Mgila Mwase (Economics Professor at the University of Dar es Salaam) in his Survey of Transport Studies in Tanzania, states that "despite its (producer surplus) relative comprehensiveness, (it) is not attractive for Tanzania-type economies because of its extensive data requirements and computer processing facilities."1/

A discussion of methodology in the Brokonsult, Dodoma Transport and Logistics Study, 1978, contains the following comments on feeder roads:

> To determine the benefits from feeder roads the user cost savings concept is difficult to apply as the growth of traffic volume is particularly hard to project. It is necessary to prepare a detailed forecast for each village area. These then form the basis for a prediction of the agricultural surplus.

This statement was merely an observation by the consultants of the Dodoma Transport Study. The suggested methodology was not applied in the study for the obvious reason that Dodoma region contains 422 villages. In the present study, there are a total of 863 villages in the three regions.

Consideration was given by the consultant to the calculations of user benefits for the passenger portion of the traffic, and thus as a complementary (and not duplicative) benefit to that derived from producer surplus. Unfortunately, however, the methodology could not be used because of the absence of existing or historical traffic data.2/ That there are real benefits associated with the passenger traffic on the study regions' rural roads access is indicated by the differences in operating costs in the Dodoma region for buses using Class I and Class II earth roads compared with gravel as shown in the tabulation below.

1/ See Economic Research Bureau Paper 783, March 1978, p. 8.
2/ Similarly, if traffic data were available, user benefits could be determined for non-agricultural traffic; but this lack of data is not nearly as significant as that of passenger traffic, because of agriculture's dominance of economic activity in the study regions.

Average Operating Costs for Buses By Type of Road Surface, Dodoma Region, 1960 (Average of 45- and 65-passenger buses)

Road Type	Operating Costs (T/shs per vehicle/kilometer)
Class I -- earth	26.4907
Class II -- improved earth	21.7902
Class III -- gravel	12.3891

Source: Updating by the consultant through the Transportation Price Index.

The savings per vehicle kilometer between Class II and Class I of operating costs contained in the Brokonsult, Dodoma Transport and Logistics Study, 1978 earth roads is T/shs 4.7005, while between Class III and Class I the savings per vehicle kilometer equals T/shs 14.1016. This represents a savings in Class II over Class I of 17 per cent, while for Class III the savings jump to 53 per cent.

The Class I road is typical of the present rural access roads which now serve the three study regions, while Class II would be representative of the 4,336 kilometers of study roads after completion of the first units of the rehabilitation program (clearing and shaping). Class III is applicable to the roads which will be graveled.

Since the bus fleet is made up of private as well as governmental operators and cooperatives operated by the villages, one can expect that a portion of these savings would be passed on to the local passengers of the study regions.

B. Agricultural Benefits

1. Background

The major agricultural benefit associated with the rural access road improvement program is that of incremental agricultural output identified primarily with increases in productivity on lands now under cultivation. This is in keeping with the main objective of the program, which is the improvement and rehabilitation of existing roads (including tracks) rather than the construction of new roads into sparsely or non-populated areas. Although there may be some additional new land developed in the existing areas as a result of the improved access, the benefits from such development were considered minor as compared with the opportunities to increase the quantity

and quality of production on the land presently being cultivated.

A number of programs are presently underway, or are being developed, for the purpose of increasing productivity in crop production through the application of improved agricultural practices. Among these is the National Maize Program, covering maize, sorghum and bulrush millet. It has made some progress in improving crop husbandry of the three commodities, as well as increases in yields, especially for sorghum, through the introduction of improved short-term varieties. The program is expected to be extended through 1981/82 and will continue and expand on such aspects as training, demonstration plots, insecticide use, staff transportation and strengthening of the extension service and ox training for ploughing and transportation.[1/]

A supplement to the National Maize Program in the Dodoma region is recommended in the Dodoma RIDEP which will assist the production of maize and sorghum on about 150,000 hectares through making available improved seed and insecticides.[2/]

A national program is currently underway to increase coffee yields of smallholdings through improved husbandry. Known as the Coffee Improvement Program, it began in 1977 with the first phase extending over four years, ending September 30, 1981. The program seeks to increase production by 50 per cent in five years and to increase the proportion of high quality coffee by 10 per cent of total production. It seeks to increase yields by establishing an extension network, providing inputs and credit to improve husbandry, pest and disease control. Extension of the program into Phase II, with financing by the European Economic Community, was announced on February 19, 1980 (Daily News). This program includes, among other areas, the Same and Mwanga districts of the Kilimanjaro region.

All of these agricultural crop improvement programs are targeted for the traditional smallholders, most of whom are subsistence farmers. The rural access road improvement program recommended in this study will serve to complement the above programs with the result that the benefits from both the agricultural and road improvement programs will be greater than if each had to operate without the other.

1/ See Dodoma Interim RIDEP, Vol. III, Agriculture, January 1980, pp. VII-29-31.

2/ Ibid., pp. V-30 and V-31.

2. Production Costs and Returns

A major first step in the application of producer surplus to the rural road improvement program was the development of production costs and returns for major crops in the three study regions which are based upon traditional versus improved agricultural practices. The traditional practices are those which largely prevail throughout the study regions, with much of the cause attributable to the extremely poor condition of the rural road network. As the result of restricted access, no access, or high cost access when served by trucks, it has been extremely difficult to provide assistance to the traditional smallholder in the form of extension service, crop financing and other aspects which would allow him to rise from the subsistence level and to become a permanent member of the exchange economy.

Estimates were made by the consultant of area cultivated for each of eleven crops while data on yields, producers' prices, and production costs were largely obtained from special studies of the Marketing Development Bureau, FAO/UNDP, Ministry of Agriculture, Dar es Salaam (Table VIII-1).

These special studies covering individual crops are on a single hectare basis. Total production costs and value of production as computed by the consultant for the entire study area thus reflect the same relationships as exist for the single hectare. A change was made by the consultant in the calculations of production costs in that only gross margin (excluding labor) was calculated in the original studies. In the present study net margin was determined by calculating a statutory minimum wage applicable rate to farmers (as distinct from casual workers) 18 years and over in rural areas (Table VIII-2).

This adjustment reveals that for all of the thirteen crops (with the exception of rice (paddy) and coffee), the traditional smallholder is making less than the rural area minimum wage established in 1975 (compare Tables VIII-2 and VIII-3).

This condition is also reflected in the net margin column of Table VIII-1 for the traditional smallholder, since a deficit occurs for all crops with the exception of rice and coffee. Actually the rice margin is very small, about 5 per cent. Coffee is really the

PRODUCTION COSTS AND RETURNS OF MAJOR AGRICULTURAL CROPS WITH TRADITIONAL VERSUS

IMPROVED PRACTICES IN THE STUDY REGIONS 1/

Agricultural Crops	SMALLHOLDER Area Cultivated (ha.)	Yield Tradi-tional (Kg./ha.)	Yield Improved (Kg./ha.)	Producer's Price Tradi-tional (T.Shs./Kg.)	Producer's Price Improved (T.Shs./Kg.)	PRODUCTION COSTS Labor Inputs Tradi-tional (T.Shs. 000)	Labor Inputs Improved (T.Shs. 000)	Other Inputs Tradi-tional (T.Shs. 000)	Other Inputs Improved (T.Shs. 000)	Total Prod. Costs Tradi-tional (T.Shs. 000)	Total Prod. Costs Improved (T.Shs. 000)	Value of Production Tradi-tional (T.Shs. 000)	Value of Production Improved (T.Shs. 000)	Net Margin Tradi-tional (T/Shs. 000)	Net Margin Improved (T.Shs. 000)	Margin Differential (T.Shs. 000)
Food Crops																
Maize	108,000	850	2,100	1.00	1.00	101,324	132,573	2,808	30,240	104,132	162,813	91,800	226,800	(12,332)	63,987	76,319
Sorghum	145,000	600	1,200	1.00	1.00	153,940	107,793	1,450	22,475	155,440	130,268	87,000	174,000	(68,440)	43,732	112,172
Millets	128,000	600	1,200	1.00	1.00	135,936	95,155	1,280	19,840	137,216	114,995	76,800	153,600	(50,216)	38,605	88,821
Cassava	6,400	1,400	3/ 5,000	3/ 0.65	0.65	8,043	11,328	-	800	8,043	12,128	5,824	20,800	(2,219)	8,672	10,891
Rice (Paddy)	3,600	(400 (2,500	4/(3,000 5/(3,500	5/ 1.50	1.50	9,908	12,298	202	1,355	10,110	13,653	10,665	6/16,875	7/ 555	3,222	2,687
Cash Crops																
Groundnuts	11,500	300	700	4.00	4.00	16,284	22,289	2,300	5,175	18,584	27,464	13,800	32,200	(4,784)	4,736	9,520
Sunflower 8/	9,500	400	800	1.45 9/	1.45	9/ 7,987	8,996	133	171	8,120	9,167	5,510	11,020	(2,610)	1,853	4,463
Castor Seed	4,600	250	800	[illegible]	1.00	2,239	5,129	-	1,053	2,239	6,182	1,150	3,680	(1,089)	(2,502)	(1,413)
Sesame	500	250	700	3.50	3.50	544	664	20	13	564	677	438	1,225	(126)	548	674
Cotton	3,700	350	800	2.84 10/	2.84 10/	5,468	7,433	56	370	5,524	7,803	3,678	8,406	(1,846)	603	2,449
Coffee	2,000	350	1,200	11.52 10/	11.52 10/	2,478	4,514	2,120	3,378	4,598	7,892	28,064	27,648	3,466	19,756	16,290

1/ 1978/79 Production Season, 1979/80 Marketing Season.

2/ Average of three package improvements.

3/ peeled dry chips.

4/ Yield of 400 kg/ha. for upland, 2,500 kg/ha. for irrigated.

5/ Yield of 3,000 kg/ha. is without fertilizer; 3,500 kg/ha. is with fertilizer.

6/ Assumes 25 percent upland and 75 percent irrigated.

7/ Assumes for the future, 25 percent with chemical fertilizer, 75 percent without chemical fertilizer.

8/ Most of crop of smallholders is interplanted with maize, beans or peas.

9/ Average of T/Shs. 1.50 per kilo for Jupiter variety and T.Shs.1.40 per kilo for Mixed variety.

10/ Average producer's price per kilo.

Source: Area cultivated is estimated by the consultant from a variety of sources including published reports and studies as well as from data provided by the Regional and District Agricultural Development Officers. The above are test estimates derived from an analysis of these various sources coupled with field interviews. Data on producer's prices and production costs are from several reports of the Marketing Development Bureau, FAO/UNDP, Ministry of Agriculture including Price Policy Recommendations for the 1980/81, Agricultural Price Review, Annex 1, Cereals and Annex 2, Oilseeds, Annual Review of the Tanzania Coffee Industry, 1978, and 1978/79 Price Review Report. (Production costs were adjusted by the consultant to include value of labor inputs.)

TABLE VIII-2
LABOR COSTS, TRADITIONAL AND IMPROVED PER HECTARE

Agricultural Crops	Number of Labor Days		Rate per Labor Day 2/ (T/shs)	Total Labor Costs (T/shs)	
	Traditional	Improved		Traditional	Improved
Food crops:					
Maize	107	140 1/	8.85	946.95	1,239.00
Sorghum and bulrush millet 3/	120	84	8.85	1,062.00	743.40
Cassava	142	200	8.85	1,256.70	1,770.00
Rice	311	386	8.85	2,752.35	3,416.10
Cash crops:					
Groundnuts	160	219	8.85	1,416.00	1,938.15
Sunflower	95	107	8.85	840.75	946.95
Castorseed	55	126	8.85	486.75	1,115.10
Sesame	123	150	8.85	1,088.55	1,327.50
Cotton	167	227 4/	8.85	1,477.95	2,008.95
Coffee	140	255	8.85	1,239.00	2,256.75

1/ Average of three package improvement programs.
2/ This is statutory minimum wage rate in effect since 1975 and applies to rural areas (farmers 18 years and over).

3/ Assumed same costs for finger millet.
4/ Estimated by the consultant.

Source: Same as Table VIII-1.

TABLE VIII-3
SMALLHOLDER RETURN PER LABOR DAY, TRADITIONAL VERSUS IMPROVED PRACTICES, BY MAJOR AGRICULTURAL CROPS

Crop	Traditional	Improved (T/shs per labor day)
Maize	7.7	10.4-15.2 (range)1/
Sorghum	4.9	12.4
Millets	4.9	12.4
Cassava	6.4	15.6
Rice (paddy)	4.6-9.9 2/	10.9-12.4 3/
Groundnuts	6.3	10.7
Sunflower	6.0	11.0
Castorseed	4.5	4.5
Sesame	6.8	13.8
Cotton	5.9	10.0
Coffee	22.4	35.8

1/ Range of three improvement packages.

2/ 4.6 = upland; 9.9 = irrigated.

3/ 10.9 = irrigated without chemical fertilizer; 12.4 = irrigated with chemical fertilizer.

Source: Same as Table VIII-1.

only traditional crop showing a substantial net margin, and this is largely due to the favorable coffee prices in recent years.

The increase in smallholders' return per labor day with improved husbandry practices averages at least a doubling of the return in most cases. It is also important to note that by far the largest share of the input costs for the improved practices is still labor costs (Table VIII-1).

3. Projected Benefits

An estimated implementation schedule was developed for adoption of the improved agricultural practices reflecting the current programs underway as well as additional expansion and the introduction of further actively-planned programs stimulated in part by the rural access road improvement project. The schedule applies only to those smallholders that will be served by the 4.336 kilometers included within the recommended rural access road program. Excluded are smallholders living in the areas served by the remaining 2,759 kilometers of rural access roads not on the district engineers' priority lists. Additionally, trunk roads serve the study area. Recognition was given to the fact that smallholders living in the vicinity of trunk roads may or may not be at the same time within zones of influence of the rural access roads. This exclusion of smallholders outside the zones of influence of the rural access roads program was accomplished by deducting 42.8 per cent of the total agricultural crop benefit stream.

The estimated implementation schedule of Table VIII-4 shows that adoption of improved practices by the traditional smallholders for the three crops accounting for the largest amount of cultivated land (maize, sorghum and millets) will not be completed until the end of year 7, 1991. In contrast, the coffee improvement program should have been completed by at least the end of 1984, which includes allowance for substantial lag.

The benefit stream in Table VIII-5 is based only upon increases in yield, which in turn is achieved by changing from traditional to improved agricultural crop husbandry. This change is both the result of ongoing and actively planned agricultural technology improvement programs and the rural access road improvement program. No data exist which make it possible to accurately measure the complementary contribution which each is making, or the degree of success which each would

TABLE VIII-4
PROJECTED IMPLEMENTATION FOR ADOPTION OF IMPROVED AGRICULTURAL PRACTICES BY TRADITIONAL SMALLHOLDERS

Crop	Crop Year 0	1	2	3	4	5	6	7
	(Accumulative percentage of total implementation)							
Maize	30	40	50	60	70	80	90	100
Sorghum	30	40	50	60	70	80	90	100
Millets	5	10	20	40	60	75	90	100
Cassava	10	20	40	65	100			
Rice	10	15	35	65	100			
Groundnuts	10	20	40	60	80	100		
Sunflower	10	20	40	60	80	100		
Sesame	10	20	40	60	80	100		
Cotton	20	30	50	70	90	100		
Coffee	100	100						

achieve without the other. But one can logically assume that the complementary contribution of the two working in tandem would be much greater than if one or the other of the two programs did not exist. An analogy can be drawn from the complementary operations of several hydroelectric power dams on a river, in which the combined output is much greater than if each of the dams were operated completely independently of the others. In view of this reasoning, the consultant, in consultation with other transportation experts, determined that the improved rural access roads would add about 60 per cent of the benefit to the total effort to bring about the adoption of an improved agricultural practices program. The benefit stream of Table VIII-5 has thus been reduced to reflect this additional 40 per cent reduction in benefits attributable to the rural access road improvement program.

4. Internal Rate of Return

The net agricultural crop benefits of Table VIII-5 are transferred to Table VIII-6 and total net benefits for the project are determined by deducting the net annual road maintenance costs of T/shs 44,725,000 (U.S. $5,590,600) from the agricultural benefits.[1/] Discount values of the total net benefits at rates of 25 and 15 per cent give an internal rate of return through interpolation of 17.3 per cent. This indicates that the rural access road improvement program has a strong economic justification based upon an accepted standard of 10 per cent as representative of the opportunity cost of capital for the Tanzanian economy. Since the cost and margin data are on an individual hectare basis with the net margins averaging about double (improved over traditional), calculations of internal rates of return for each of the three regions in the study would come up with about the same results as for the three regions combined.

It should also be noted that if data had been available for measuring the producer surplus of additional crops grown in the study areas, the internal rate of return would be even larger. Among these are fruits and vegetables and grain legumes grown in various parts of the study areas with substantial expansion being promoted, especially in the Dodoma region, and bananas, sugarcane and pyrethrum in Same and Mwanga.

1/ The annual road maintenance costs associated with the improved road program are net in that the present annual maintenance cost of about T/shs 1,200 per kilometer have been deducted from the above costs.

TABLE VIII-5
BENEFIT STREAM OF MAJOR AGRICULTURAL CROPS ASSIGNABLE TO THE RURAL ACCESS ROAD REHABILITATION PROGRAM, COMBINED STUDY REGIONS

End of Evaluation Year	End of Calendar Year	Food Crops				
		Maize	Sorghum	Millets (T/shs 000)	Cassava	Rice
0	1984					
1	1985	10,477	15,399	3,049	748	137
2	1986	13,069	19,249	6,097	1,495	320
3	1987	15,683	23,098	12,194	2,430	595
4	1988	18,297	26,948	18,292	3,738	916
5	1989	20,911	28,873	22,862	3,738	916
6	1990	23,525	34,648	27,435	3,738	916
7	1991	26,192	38,497	30,484	3,738	916
8	1992	26,192	38,497	30,484	3,738	916
9	1993	26,192	38,497	30,484	3,738	916
10	1994	26,192	38,497	30,484	3,738	916
11	1995	26,192	38,497	30,484	3,738	916
12	1996	26,192	38,497	30,484	3,738	916
13	1997	26,192	38,497	30,484	3,738	916
14	1998	26,192	38,497	30,484	3,738	916
15	1999	26,192	38,497	30,484	3,738	916
16	2000	26,192	38,497	30,484	3,738	916
17	2001	26,192	38,497	30,484	3,738	916
18	2002	26,192	38,497	30,484	3,738	916
19	2003	26,192	38,497	30,484	3,738	916
20	2004	26,192	38,497	30,484	3,738	916

TABLE VIII-5
BENEFIT STREAM OF MAJOR AGRICULTURAL CROPS ASSIGNABLE TO THE RURAL ACCESS ROAD REHABILITATION PROGRAM, COMBINED STUDY REGIONS

End of Evaluation Year	End of Calendar Year	Cash Crops					Total All Crops
		Ground-nuts	Sun-flower	Sesame	Cotton	Coffee	
		(T/shs 000)					
0	1984						
1	1985	653	307	46	252	5,591	36,659
2	1986	1,307	613	92	421	5,591	48,254
3	1987	1,960	919	139	589	5,591	63,198
4	1988	2,614	1,225	185	757	5,591	78,563
5	1989	3,267	1,532	232	841	5,591	88,763
6	1990	3,267	1,532	232	841	5,591	101,725
7	1991	3,267	1,532	232	841	5,591	111,290
8	1992	3,267	1,532	232	841	5,591	111,290
9	1993	3,267	1,532	232	841	5,591	111,290
10	1994	3,267	1,532	232	841	5,591	111,290
11	1995	3,267	1,532	232	841	5,591	111,290
12	1996	3,267	1,532	232	841	5,591	111,290
13	1997	3,267	1,532	232	841	5,591	111,290
14	1998	3,267	1,532	232	841	5,591	111,290
15	1999	3,267	1,532	232	841	5,591	111,290
16	2000	3,267	1,532	232	841	5,591	111,290
17	2001	3,267	1,532	232	841	5,591	111,290
18	2002	3,267	1,532	232	841	5,591	111,290
19	2003	3,267	1,532	232	841	5,591	111,290
20	2004	3,267	1,532	232	841	5,591	111,290

TABLE VIII-6
SUMMARY OF NET AGRICULTURAL CROP BENEFITS, ROAD MAINTENANCE COSTS AND INTERNAL RATE OF RETURN

End of Evaluation Year	End of Calendar Year	Net Agri-cultural Crop Benefits	Less Road Mainten-ance Costs (T/shs 000)	Total Net Benefits	Discounted Values (%) 25	15
0	1984					
1	1985	36,659	44,725	- 8,066	- 6,453	- 7,014
2	1986	48,254	44,725	3,529	2,259	2,668
3	1987	63,198	44,725	18,473	9,458	12,146
4	1988	78,563	44,725	33,838	13,860	19,349
5	1989	88,763	44,725	44,038	14,431	21,896
6	1990	101,725	44,725	57,000	14,939	24,641
7	1991	111,290	44,725	66,565	13,959	25,022
8	1992	111,290	44,725	66,565	11,170	21,760
9	1993	111,290	44,725	66,565	8,933	18,924
10	1994	111,290	44,725	66,565	7,149	16,455
11	1995	111,290	44,725	66,565	5,718	14,305
12	1996	111,290	44,725	66,565	4,573	12,441
13	1997	111,290	44,725	66,565	3,661	10,817
14	1998	111,290	44,725	66,565	2,929	9,406
15	1999	111,290	44,725	66,565	2,343	8,181
16	2000	111,290	44,725	66,565	1,870	7,116
17	2001	111,290	44,725	66,565	1,498	6,184
18	2002	111,290	44,725	66,565	1,198	5,378
19	2003	111,290	44,725	66,565	959	4,680
20	2004	111,290	44,725	66,565	765	4,067
	Total				115,219	238,422
	Total investment cost of road (TIC)				(-)210,000 (US $26,250,000)	210,000
	Difference between discounted benefits and TIC				(-) 94,781	28,422

By interpolation the internal rate of return equals 17.3.

Another possible source of benefit is that from livestock. Although the improved roads will certainly benefit the livestock industry in terms of providing access for the visits of livestock development officers and other governmental officials, as well as for the delivery of such inputs as dip chemicals, the use of trucks for moving livestock from the villages to the first market is not a common practice in Tanzania. In fact, other than for occasional movements of small animals (sheep and goats) mostly out of the region, trucks are rarely used at the present time. Discussions by the consultant with numerous livestock specialists throughout the study areas and in Dar es Salaam revealed that most of the specialists believed any real introduction of trucks for hauling livestock and especially cattle would be a long way off. Mr. Harry Carpenter, Livestock Marketing Officer with TAMU/TLMC described the problem as follows:

> One of the first problems that will be encountered in adopting the use of truck transportation of livestock will be the restructuring of the thinking of the involved people in the livestock industry toward a different approach to livestock movement. 1/

In view of the uncertainty surrounding the acceptance by the industry of truck transportation, the consultant decided not to pursue the matter further.

An additional consideration is that even if it were assumed that a change toward trucks might begin to occur, anything less than ten years would appear overly optimistic In those circumstances, benefits which are substantially down the discount scale rapidly lose their present value, and thus their contribution is not significant unless one is dealing with really large numbers.

The nonquantifiable but extremely important social benefits associated with improved access have already been thoroughly discussed in other parts of this report, and thus will not be repeated here.

C. Employment Benefits

An additional benefit which does need to be mentioned and which can be quantified is that of the additional employment arising from the road improvement program and, in particular, the maintenance program

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1/ Letter to the General Manager, TLMC, Dar es Salaam, Livestock Transportation by Truck, May 4, 1979.

which will continue in effect under expatriate supervision for an additional three years after completion of the road rehabilitation program.

The road rehabilitation program is designed to utilize manpower from ComWorks, and thus it may or may not have to call upon local labor to fill in as needed. But the formalized maintenance program to accompany and to continue beyond the rehabilitation program will provide very substantial employment for local labor. The maintenance program as now scheduled will begin near the end of year 1 of the rehabilitation program, or as soon as sufficient roads have been rehabilitated so that maintenance can begin. The program will then continue through the three years of the rehabilitation program, expanding as additional roads are completed so that by the end of the three-year rehabilitation program, the full force of the maintenance crew will have been engaged. The scheduled maintenance program under expatriate supervision would then continue for an additional three years. Beyond that period, sufficient Tanzanian supervisory personnel, machine operators, labor foremen and workers will have been trained to continue the program without the assistance of the expatriates.

By the end of year 3 of the rehabilitation program, the maintenance program then in full operation will require the employment of 4,560 local laborers for the three regions. On an individual region basis, Dodoma will require 2,530, Singida 1,400, and the Same/Mwanga districts of Kilimanjaro 630. Wages to be paid the local laborers are T/shs 300 per month, equivalent to T/shs 3,600 per year. The total annual wage bill is thus T/shs 16,416,000, while on a regional basis it will be:

Dodoma -- T/shs 9,108,000
Singida -- T/shs 5,040,000
Same/Mwanga -- T/shs 2,268,000

These additional employment benefits will provide a very substantial boost to the families of the laborers and to the local villages in which they live. This is especially so when one considers that the return per labor day for the traditional smallholder ranges from T/shs 4.5 to about T/shs 8.0.

Appendix

TABLE A-IV-1
POPULATION DISTRIBUTION IN PER CENT BY DISTRICT AND ADMINISTRATIVE DIVISION, 1978

Region	District	Administrative Division		Per Cent Distribution by Division	Per Cent Distribution by District
Dodoma	Dodoma Rural	Itiso		10.69	
		Chamwino		13.76	
		Mvumi		14.55	
		Mwitikira		13.08	
		Chipanga		11.54	
		Bahi		12.75	
		Makangwa		10.31	
		Mundemu		13.32	
			Total	100.00	28.47
	Dodoma Urban	Hombolo		21.16	
		Kikombo		15.45	
		Nala		14.06	
		Mpunguzi		9.89	
		Urban Center		39.44	
			Total	100.00	16.32
	Mpwapwa	Mpwapwa		24.92	
		Kibakwe		13.71	
		Mlali		19.29	
		Zoissa		12.70	
		Kongwa		14.81	
		Rudi		14.57	
			Total	100.00	26.83

Source: 1978 Census of Population, Bureau of Statistics (Provisional data).

TABLE A-IV-2
POPULATION DISTRIBUTION IN PER CENT BY DISTRICT AND ADMINISTRATIVE DIVISION, 1978

Region	District	Administrative Division	Per Cent Distribution by Division	Per Cent Distribution by District
Dodoma	Kondoa	Kondoa	11.45	
		Mondo	17.11	
		Farkwa	5.33	
		Kwamtoro	9.44	
		Pahi	18.61	
		Goima	10.17	
		Bereko	16.26	
		Kolo	11.63	
		Total	100.00	28.38
Singida	Singida Rural	Ihanja	11.50	
		Ikungi	13.68	
		Mungaa	11.81	
		Mtinko	27.20	
		Mgori	10.34	
		Ilongero	25.47	
		Total	100.00	34.81
	Singida Urban			9.10
	Iramba	Kiruni	13.19	
		Nduguti	17.86	
		Kinyangiri	11.22	
		Kinampanda	12.26	
		Kisiriri	15.06	
		Ndago	15.57	
		Shelui	14.84	
		Total	100.00	39.41

Source: 1978 Census of Population, Bureau of Statistics (Provisional data).

TABLE A-IV-3

POPULATION DISTRIBUTION IN PER CENT BY DISTRICT AND ADMINISTRATIVE DIVISION, 1978

Region	District	Administrative Division	Per Cent Distribution by Division	Per Cent Distribution by District
Singida	Manyoni	Manyoni	15.00	
		Itigi	17.48	
		Manyoni Vijijini	12.91	
		Kintinku	18.00	
		Nkonko	36.61	
		Total	100.00	16.68
Kiliman-jaro	Same	Same	11.27	
		Mwembe Mbaga	19.76	
		Gonja	13.32	
		Chome/Suji	17.59	
		Mamba Vunta	17.73	
		Ndungu	20.33	
		Total	100.00	64.49
	Mwanga	Ugweno	34.00	
		Usangi	27.18	
		Mwanga	18.66	
		Lembeni	20.16	
		Total	100.00	35.51

Source: 1978 Census of Population, Bureau of Statistics (Provisional data).

TABLE A-IV-4
TOTAL DODOMA EMPLOYMENT AND EARNINGS,
1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	18	642	2.7
Mining and quarrying	2	632	4.8
Manufacturing and handicrafts	27	1,300	5.7
Electricity and water supply	5	816	4.4
Construction	6	2,103	9.2
Wholesale and retail trade, restaurants and hotels	47	1,107	5.4
Transport, storage, communications	22	2,714	18.7
Finance, insurance, real estate, and business services	6	109	0.8
Public administration and community services	70	7,956	73.8
Total	203	17,379	125.6 1/

1/ Failure of column to add to total is due to rounding.

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-5
DODOMA URBAN EMPLOYMENT AND EARNINGS,
1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	4	106	0.4
Mining and quarrying	2	632	4.8
Manufacturing and handicrafts	21	1,210	5.4
Electricity and water supply	2	602	3.4
Construction	3	1,264	5.6
Wholesale and retail trade, restaurants and hotels	43	1,096	5.3
Transport, storage, communications	14	1,920	15.2
Finance, insurance, real escate, and business services	6	109	0.8
Public administration and community services	36	5,022	48.3
Total	131	11,961	89.2

Note: Does not include subsistence farming.

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-6
DODOMA RURAL EMPLOYMENT AND EARNINGS,
1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	6	130	0.4
Construction	1	263	1.5
Transport, storage, communications	2	759	3.2
Public administration and community services	10	1,176	8.3
Total	19	2,328	13.4

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-7
KONDOA EMPLOYMENT AND EARNINGS, 1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	3	139	0.7
Manufacturing and handicrafts	4	15	-
Electricity and water supply	1	46	0.2
Construction	1	305	1.0
Transport, storage, communications	3	12	0.1
Public administration and community services	12	760	10.8
Total	24	1,277	12.8

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-8
MWAPWA EMPLOYMENT AND EARNINGS, 1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	5	267	1.2
Mining and quarrying	-	-	-
Manufacturing and handicrafts	2	75	0.3
Electricity and water supply	2	168	0.8
Construction	1	271	1.1
Wholesale and retail trade, restaurants and hotels	4	11	-
Transport, storage, communications	3	23	0.1
Finance, insurance, real estate and business services	-	-	-
Public administration and community services	12	998	6.5
Total	29	1,813	10.0

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-9
TOTAL SINGIDA EMPLOYMENT AND EARNINGS,
1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	17	581	2.8
Mining and quarrying	-	-	-
Manufacturing and handicrafts	12	23	0.1
Electricity and water supply	4	479	2.0
Construction	5	661	2.5
Wholesale and retail trade, restaurants and hotels	33	655	3.0
Transport, storage, communications	7	105	0.7
Finance, insurance, real estate and business services	6	100	0.9
Public administration and community services	66	3,640	22.6
Total	150	6,244	34.6

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-10
SINGIDA URBAN EMPLOYMENT AND EARNINGS,
1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	5	305	1.5
Mining and quarrying	-	-	-
Manufacturing and handicrafts	4	17	0.1
Electricity and water supply	2	427	1.8
Construction	3	361	1.4
Wholesale and retail trade, restaurants and hotels	26	579	2.8
Transport, storage, communications	3	33	0.2
Finance, insurance, real estate and business services	4	77	0.6
Public administration and community services	25	1,073	7.0
Total	72	2,868	15.4

Source. Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-11
SINGIDA RURAL EMPLOYMENT AND EARNINGS,
1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	4	30	0.1
Mining and quarrying	-	-	-
Manufacturing and handicrafts	4	2	- 1/
Electricity and water supply	-	-	-
Construction	-	-	-
Wholesale and retail trade, restaurants and hotels	2	6	- 1/
Transport, storage, communications	-	-	-
Finance, insurance, real estate and business services	-	-	-
Public administration and community services	9	330	1.5
Total	19	368	1.7 2/

1/ Less than 0.05.

2/ Failure of column to add to total is due to rounding.

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-12
IRAMBA EMPLOYMENT AND EARNINGS, 1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	4	114	0.4
Mining and quarrying	-	-	-
Manufacturing and handicrafts	3	3	1/
Electricity and water supply	1	12	1/
Construction	1	73	0.4
Wholesale and retail trade, restaurants and hotels	1	19	1/
Transport, storage, communications	1	3	1/
Finance, insurance, real estate and business services	1	13	0.1
Public administration and community services	12	1,083	6.7
Total	24	1,320	7.8 2/

1/ Less than 0.05.

2/ Failure of column to add to total is due to rounding.

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-13
MANYONI EMPLOYMENT AND EARNINGS, 1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	4	132	0.6
Mining and quarrying	-	-	-
Manufacturing and handicrafts	1	1	1/
Electricity and water supply	1	40	0.2
Construction	1	227	0.8
Wholesale and retail trade, restaurants and hotels	4	51	0.2
Transport, storage, communications	3	69	0.4
Finance, insurance, real estate and business services	1	10	0.1
Public administration and community services	20	1,154	7.4
Total	35	1,684	9.8 2/

1/ Less than 0.05.

2/ Failure of column to add to total is due to rounding.

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-14
SAME/MWANGA EMPLOYMENT AND EARNINGS, 1976

Sector	Number of Establish-ments	Total Employees	Total Earnings (Million T/shs)
Agriculture, hunting, forestry, and fishing	5	857	2.9
Mining and quarrying	1	27	0.1
Manufacturing and handicrafts	-	-	-
Electricity and water supply	1	64	0.3
Construction	1	373	1.3
Wholesale and retail trade, restaurants and hotels	5	255	0.[illegible]
Transport, storage, communications	1	6	-
Finance, insurance, real estate and business services	-	-	-
Public administration and community services	17	1,905	13.4
Total	31	3,487	18.9

Source: Bureau of Statistics, Dar es Salaam (unpublished data).

TABLE A-IV-15
NATIONAL EMPLOYMENT AND WAGE BILL BY MAJOR SECTORS
(1973-1976)

Sector	Employment 1973 1/	Employment 1976 2/	Percentage Change 1973-76	Annual Wage Bill (Million T/shs) 3/ 1973 1/	Annual Wage Bill (Million T/shs) 3/ 1976 2/	Percentage Change 1973-76
Agriculture, hunting, forestry and fishing	109,047	132,343	+21.4	273.2	409.4	+49.9
Mining and quarrying	5,013	5,241	+ 4.5	31.8	33.9	+ 6.6
Manufacturing and handicrafts	59,336	75,003	+26.4	315.0	454.8	+44.4
Electricity and water supply	18,904	12,839	-33.1	83.7	56.6	-32.4
Construction	104,777	42,820	-60.9	280.8	206.6	-26.4
Wholesale and retail trade, restaurants and hotels	26,713	37,978	+42.2	179.3	220.9	+23.2
Transport, storage and communications	38,115	52,167	+36.9	284.2	411.5	+44.8
Finance, insurance, real estate and business services	6,515	9,080	+39.4	77.9	110.3	+41.6
Public administration and community services	104,083	110,782	+ 6.4	629.6	820.0	+30.2
Total	472,505	478,253	+ 1.2	2,155.5	2,724.1	+26.4

1/ The Economic Survey, 1977-78, United Republic of Tanzania, printed by The Government Printer, 1979, p. 44.
2/ Bureau of Statistics (unpublished figures).
3/ Current prices.

TABLE A-IV-16
PROJECTIONS OF POPULATION BY ADMINISTRATIVE DIVISION, 1978-1990

Region	District	Administrative Division	Population 1978	Per Cent Distribution by Division 1978	Per Cent Distribution by Division 1990	Annual Average Growth Rate 1978-1990 (%)	Population 1990
Dodoma	Dodoma Rural	Itiso	29,585	10.7	10.8	2.1	38,000
		Chamwino	38,066	13.8	13.8	2.0	48,000
		Mvumi	40,282	14.5	14.6	2.0	51,000
		Mwitikira	36,216	13.1	13.1	2.0	46,000
		Chipanga	31,940	11.5	11.5	1.9	40,000
		Bahi	35,295	12.8	12.7	2.0	45,000
		Makangwa	28,526	10.3	10.2	2.0	36,000
		Mundemu	36,827	13.3	13.3	2.0	47,000
	District Total		276,737	100.0	100.0	2.0	351,000
Dodoma	Dodoma Urban	Hombolo	33,559	35.0	35.3	3.5	51,000
		Kikombo	24,509	25.5	25.4	3.5	37,000
		Nala	22,308	23.2	23.2	3.6	34,000
		Mpunguzi	15,666	16.3	16.1	3.3	23,000
	District Total		96,042	100.0	100.0	3.5	145,000

TABLE A-IV-17
PROJECTIONS OF POPULATION BY ADMINISTRATIVE DIVISION,
1978-1990

Region	District	Administrative Division	Population 1978	Per Cent Distribution by Division 1978	1990	Annual Average Growth Rate 1978-1990 (%)	Population 1990
Dodoma	Mwapwa	Mpwapwa	65,173	24.9	25.1	3.2	95,000
		Kibakwe	35,844	13.7	13.6	3.2	52,000
		Mlali	50,448	19.3	19.3	3.1	73,000
		Zoissa	33,225	12.7	12.7	3.1	48,000
		Kongwa	38,740	14.8	14.9	3.1	56,000
		Rudi	38,095	14.6	14.4	3.1	55,000
	District Total		261,525	100.0	100.0	3.1	379,000
Dodoma	Kondoa	Kondoa	31,513	11.5	11.4	2.2	41,000
		Mondo	47,076	17.1	17.2	2.2	61,000
		Farkwa	14,676	5.3	5.1	1.7	18,000
		Kwamtoro	25,977	9.4	9.5	2.3	34,000
		Pahi	51,208	18.6	18.7	2.3	67,000
		Goima	27,963	10.2	10.1	2.1	36,000
		Bereko	44,715	16.3	16.4	2.3	59,000
		Kolo	31,954	11.6	11.6	2.1	41,000
	District Total		275,082	100.0	100.0	2.2	357,000
Region Total (without Dodoma town)			909,386			2.8	1,232,000

TABLE A-IV-18
PROJECTIONS OF POPULATION BY ADMINISTRATIVE DIVISION, 1978-1990

Region	District	Administrative Division	Population 1978	Per Cent Distribution by Division 1978	1990	Annual Average Growth Rate 1978-1990 (%)	Population 1990
Singida	Singida Rural	Ihanja	24,597	11.5	11.3	2.7	34,000
		Ikunji	29,242	13.7	13.6	2.9	41,000
		Mungaa	25,224	11.8	11.9	2.8	35,000
		Mtinko	58,133	27.2	27.4	2.9	82,000
		Mgori	22,098	10.3	10.2	2.6	30,000
		Ilongero	54,438	25.5	25.6	2.8	76,000
	District Total		213,732	100.0	100.0	2.8	298,000
Singida	Iramba	Kirumi	31,929	13.2	13.0	2.3	42,000
		Nduguti	43,220	17.9	18.1	2.5	58,000
		Kinyangiri	27,145	11.2	11.2	2.4	36,000
		Kinampanda	29,679	12.3	12.3	2.5	40,000
		Kisiriri	36,454	15.0	15.0	2.3	48,000
		Ndago	37,690	15.6	15.7	2.6	51,000
		Shelui	35,886	14.8	14.7	2.3	47,000
	District Total		242,003	100.0	100.0	2.4	322,000

TABLE A-IV-19
PROJECTIONS OF POPULATION BY ADMINISTRATIVE DIVISION, 1978-1990

Region	District	Administrative Division	Population 1978	Per Cent Distribution by Division 1978	Per Cent Distribution by Division 1990	Annual Average Growth Rate 1978-1990 (%)	Population 1990
Singida	Manyoni	Manyoni	15,358	15.0	15.2	2.2	20,000
		Itigi	17,905	17.5	17.6	2.1	23,000
		Manyoni Vijijini	13,214	12.9	12.6	1.6	16,000
		Kintinku	18,434	18.0	18.0	1.9	23,000
		Nkonko	37,492	36.6	36.6	2.1	48,000
	District Total		102,403	100.0	100.0	2.2	130,000
	District Total as % of Region		-	16.7	-	15.4	-
	Singida Urban		55,392	9.1 1/	11.2 1/	4.5	95,000
Region Total			614,030	-	-	2.7	845,000

1/ Per cent of regional total.

TABLE A-IV-20
PROJECTIONS OF POPULATION BY ADMINISTRATIVE DIVISION,
1978-1990

Region	District	Administrative Division	Population 1978	Per Cent Distribution by Division 1978	1990	Annual Average Growth Rate 1978-1990 (%)	Population 1990
Kiliman-jaro	Same	Same	15,080	11.3	11.5	3.2	22,000
		Mwembe Mbaga	26,429	19.8	19.8	2.8	37,000
		Gonja	17,800	13.3	13.3	2.9	25,000
		Chome/Suji	23,524	17.6	17.7	2.9	33,000
		Mamba Vunta	23,716	17.7	17.5	2.8	33,000
		Ndungu	27,176	20.3	20.2	2.8	38,000
	District Total		133,725	100.0	100.0	2.9	188,000
	District Total as % of Region			14.8			
Kiliman-jaro	Mwanga	Ugweno	25,032	34.0	34.0	2.6	34,000
		Usangi	20,013	27.1	27.2	2.8	28,000
		Mwanga	13,742	18.7	18.7	2.7	19,000
		Lembeni	14,843	20.2	20.1	2.5	20,000
	District Total		73,630	100.0	100.0	2.7	101,000
	District Total as % of Region			8.2			

APPENDIX A-IV-D

Regional water supply summaries and a discussion of procedures are presented as follows:

--Dodoma region--Individual village system "assessments of priority" included in the Water Master Plan Dodoma[1/] were assigned to each of the administrative divisions. The number of systems ranged from a low of 1 system per division to a high of 11 systems per division. In terms of individual system assessment the range of priority points covered a range of 3.3 (adequate) to 12.0 (inadequate).

A two-step process was employed to develop a uniform index for each of the administrative divisions. The first step was to calculate the average administrative division raw score from the individual system score presented in the Master Plan. The second step was to array all average scores, per division, in five unified categories, e.g., a range of 3.3 to 7.2 produced the ranking schedule: 3.3-4.0 (Good); 4.1-4.8 (Above Average); 4.9-5.6 (Average); 5.7-6.4 (Below Average); and 6.5-7.2 (Poor). It is felt that the large number of systems in the sample produced a reasonable framework for relative division level ranking. The results of the application of the rural water supply relative index method are presented in Table A-IV-21.

--Singida region--The individual system inventories presented in the Water Master Plan Singida[2/] were employed to develop relative indices for each of the administrative divisions. Each of the 307 system inventories included a separate section to indicate "problems" with the system. The six problems which would be indicated were 1) "insufficient water," 2) "too far from village homes," 3) "poor organization," 4) "contamination," 5) "fuel shortage," and 6) "poor maintenance." For the purposes of this assessment, only three categories were used--supply, distance and contamination. If one of these categories of problems was cited for a particular system, the system was considered inadequate. The raw data on each system were arranged ac-

1/ Water Master Plan Dodoma Region, Ministry of Water Development and Power, Vol. 2, Section XI, 1974.
2/ Singida Region Water Resources Survey, Australian Development Assistance Bureau, Vol. 2A, 2B and 2C, May 1978.

TABLE A-IV-21
DODOMA REGION RURAL WATER SUPPLY

District	Administrative Division	Relative Water Supply Index
Dodoma Rural	Itiso	Poor (5)
	Chamwino	Above Average (2)
	Mvumi	Average (3)
	Mwitikira	Average (3)
	Chipanga	Average (3)
	Bahi	Average (3)
	Makangwa	Average (3)
	Mundemu	Average (3)
Dodoma Urban	Hombolo	Above Average (2)
	Kikombo	Above Average (2)
	Nala	Above Average (2)
	Mpunguzi	Above Average (2)
Mpwapwa	Mpwapwa	Above Average (2)
	Kibakwe	Good (1)
	Mlali	Above Average (2)
	Zoissa	Above Average (2)
	Kongwa	Good (1)
	Rudi	Above Average (2)
Kondoa	Kondoa	Poor (5)
	Mondo	Average (3)
	Farkwa	Above Average (2)
	Kwamtoro	Poor (5)
	Pahi	Average (3)
	Goima	Poor (5)
	Bereko	Above Average (2)
	Kolo	Poor (5)

cording to the administrative division in which the system is sited. The next steps involved 1) differentiations between the number of adequate and inadequate systems for each division, 2) calculating the ratio of inadequate systems as a per cent of total systems, 3) arraying the range of percentages by district, 4) establishing five intervals of adequacy based on the ratio of inadequate systems to total systems for the region, and 5) assigning the interval scores (1, 2 . . .5) to each administrative division. The results of the ranking procedure are presented in Table A-IV-22.

--Kilimanjaro region (Same/Mwanga Districts)--The detailed inventory of all existing water supply systems included in the Water Master Plan Kilimanjaro Region[1/] was used as the framework for the relative water supply indexing by administrative division. Each of the 158 supply systems was assigned to the appropriate administrative division, and the corresponding water capacities in cubic meters a day were recorded. The second step involved calculation of administrative division daily water requirements in cubic meters as a function of the 1978 population and under the Master Plan assumption of 54 liters per day per person for the Kilimanjaro region. This requirement, cited in the Plan, reflects the urbanization of Same, the installation of water distribution systems, and the use pattern of the region.

The final step involved 1) computing the per cent of the daily requirement met with existing system capacities by administrative division, 2) arraying the percentages for the districts, 3) stipulating the 5 equal intervals for the region, and 4) assigning the resultant index to each division. Table A-IV-23 presents a display of the water system adequacy index for the Same and Mwanga districts of the Kilimanjaro region.

1/ Water Master Plan Kilimanjaro Region, Japan International Cooperation Agency, Vol. VII, 1977.

TABLE A-IV-22
SINGIDA REGION RURAL WATER SUPPLY

District	Administrative Division	Relative Water Supply Index
Singida Rural	Ihanja	Poor (5)
	Ikungi	Fair (4)
	Mungaa	Fair (4)
	Mtinko	Poor (5)
	Mgori	Poor (5)
	Ilongero	Average (3)
Iramba	Kirumi	Good (1)
	Nduguti	Fair (4)
	Kinyangiri	Above Average (2)
	Kinampanda	Above Average (2)
	Kisiriri	Average (3)
	Ndago	Above Average (2)
	Shelui	Above Average (2)
Manyoni	Manyoni	Average (3)
	Itigi	Good (1)
	Manyoni Vijijini	Good (1)
	Kintinku	Good (1)
	Nkondo	Average (3)

TABLE A-IV-23
KILIMANJARO REGION RURAL WATER SUPPLY

District	Administrative Division	Relative Water Supply Index
Same	Same	Good (1)
	Mwembe Mbaga	Average (3)
	Gonja	Good (1)
	Chome/Suji	Good (1)
	Mamba Vunta	Poor (5)
	Ndungu	Poor (5)
Mwanga	Ugweno	Good (1)
	Usangi	Good (1)
	Mwanga	Average (3)
	Lembeni	Poor (5)

APPENDIX A-IV

SOCIAL ANTHROPOLOGICAL VISITS TO SELECTED VILLAGES IN THE STUDY AREA

Social anthropological input into the overall feasibility study consisted of (1) reviews of ethnographic field reports written by anthropologists and of reports by others who have lived among the peoples inhabiting the regions of Dodoma, Singida, and the Same/Mwanga districts of Kilimanjaro, and (2) field visits by the social anthropologist to twelve villages in the regions encompassed by the study.

Secondary Materials. Research using secondary materials was conducted in the libraries of the University of Dar Es Salaam and Duke University, which together have the most relevant documents. A few documents, especially older reports on some of the peoples in obscure sources, were obtained from other libraries in the United States. These were consulted prior to the initial field visit to Tanzania (December 27-January 12), during the interim between field research (mid-January to the end of February), and during the second field visit (March). These reports were useful in providing background information on traditional cultural practices and habits of the several ethnic groups living in Dodoma, Singida, and Same/Mwanga. In addition, the social anthropologist had conducted field research among the Pare people of Kilimanjaro region for a period totaling nearly two years in 1967, 1968, and 1972.

Primary Field Research. Based on the available information about traditional homelands, Map IV-1 showing the ethnic groups of the regions was prepared. Field trips were arranged so that at least one day could be spent talking with people of each of the ethnic groups in the study areas. This was accomplished by a visit to Kilimanjaro region in January and to Dodoma and Singida in March. A total of twelve villages were selected for field visits. In addition to these, several others which were passed through were visited on a less systematic basis. For these twelve villages, an open-ended interview schedule was prepared and in most cases information was provided by the Village Chairman, the Village Secretary, the local CCM (Party) officials, teachers, doctors, and/or other knowledgeable villagers.

The following table lists the villages which were studied in detail, the dates of field visits, and the persons who provided information.

TABLE A-IV-24
VILLAGES SELECTED FOR ANTHROPOLOGICAL SITE VISITS

Name of Village	Region	District	Division	Date	Interviewees
1. Hombolo Makulu	Dodoma	Dodoma Urban	Hombolo	3/13/80	Magistrate, Livestock Officer, and other villagers.
2. Mvumi	Dodoma	Dodoma Rural	Mvumi	3/14/80	Village Chairman, Road Inspector, and several villagers.
3. Goima	Dodoma	Kondoa	Goima	3/16/80	Village Chairman and other villagers.
4. Mungaa	Singida	Singida	Mungaa	3/18/80	Village Secretary an other villagers.
5. Nduguti	Singida	Iramba	Nduguti	3/19/80	Ward Secretary, Village Secretary, and other villagers.
6. Kinyangiri	Singida	Iramba	Kinyangiri	3/19/80	Village Chairman and other villagers.
7. Makanda	Manyoni	Kintinku	Kintinku	3/20/80	CCM Secretary, Village Secretary, and a teacher.
8. Mlali	Dodoma	Manyoni	Mlali	3/21/80	Village Secretary, a teacher, and the livestock field attendant.
9. Mwanga	Kilimanjaro	Mwanga		1/4/80	Ward Secretary.
10. Usangi & Ugweno	Kilimanjaro	Mwanga		1/4/80, 1/5/80	Teacher, Village Chairman, Medical Assistant, and other villagers.
11. Gonja Bombo	Kilimanjaro	Same		1/6/80	Doctor and villagers.
12. Mbaga Manka	Kilimanjaro	Same		1/6/80	Teacher, minister, and villagers.

In addition to these interviews conducted in the villages named above, the social anthropologist met with the following government officials, or their assistants: the Regional Development Directors of Dodoma, Singida, and Kilimanjaro; and the District Development Directors of Dodoma Urban, Dodoma Rural, Mpwapwa, Kondoa, Singida, Iramba, Manyoni, Mwanga, and Same. In all cases, these government officials provided needed assistance by writing letters of introduction to the Village Chairmen of the villages which were selected for study. Since the social anthropologist was able to conduct his interviews in Swahili, he did not require specific assistance of any government officials from regional or district headquarters. Except for the village of Mvumi in the Dodoma Rural division, when a staff member of ComWorks accompanied him to

the village, he was allowed full and free access to the villages to discuss the lifestyle of villagers, focusing specifically on aspects which may be affected by improved access roads.

The interview schedule (developed in full after interviews were conducted in Same/Mwanga in January) is contained in Table A-IV-25.

TABLE A-IV-25
INTERVIEW SCHEDULE COVERING TOPICS DISCUSSED
DURING VISITS TO SELECTED VILLAGES

(Note: The outline which follows lists the topics which were discussed. In most instances, the topics were discussed in this order and interviews usually took place in Swahili. In a few instances, English was used when village officials were especially fluent in English or preferred to use English.)

1. Social Composition of the Village
   a. General organization of the village, population size, facilities, etc.
   b. Degree of correspondence between published information on the characteristics of the ethnic group living in this area and contemporary conditions, especially changes brought about in village organization as a result of villagization in the 1970s.

2. Ethnic Composition of the Village
   a. Ethnic group or groups residing in the village.
   b. Assessment of any unusual features of the residents of this village as representatives of their respective ethnic groups.

3. Mode of Livelihood
   a. Food crops and animals used for food.
   b. Degree to which village residents are engaged in cash-earning occupations outside the village.
   c. Shopkeeping (including numbers of private and cooperative shops, both presently and in the past).
   d. Craft industries (for local sales and sales outside the community).
   e. Cash cropping and livestock sales.

4. Mobility
   a. Methods of transportation (types of vehicles, roads used, frequency).
   b. Reasons for movement in and out of villages (to obtain social services not locally available; to bring in items for sale; transport of cash crops; social services; etc.).
   c. Access to markets (mode of transporting goods to market, distance to market).

5. Women
   a. Division of labor between men and women.
   b. Differential impact of improved roads on the roles of men and women.

6. Education
   a. Assessment of general level of education in the village population.
   b. Number of Basic Primary Schools and Secondary Schools (government and private).
   c. Distance to schools for school age children.
   d. Age structure of children in schools.

e. Degree of facility in Swahili.
f. Adult education facilities.
g. Vocational education facilities.

7. Social Services
   a. Water supply (for humans and livestock).
   b. Health facilities (locally available and distance and means of transport to major hospitals).
   c. Government offices and community centers.
   d. Transportation facilities (buses, trucks, cars--whether community owned or for hire from private owners).

8. Benefits of Improved Roads
   a. Aspects of community life which are most and least likely to be affected by improved roads.
   b. Qualitative assessment of need for improved roads as expressed by villagers.

9. Manpower for Road Building and Maintenance
   a. Current procedures for maintenance of existing roads.
   b. Available manpower for road building and for long-term road maintenance.

In the pages which follow, summaries of information collected during these interviews are presented. To facilitate comparison, these data are presented in the order outlined in the interview schedule.

1. Hombolo Makulu Village (Dodoma Urban District) March 13, 1980

A visit of several hours' duration was made on the afternoon of March 13 to the village of Hombolo Makulu, located in Dodoma Urban district. Primary data were gathered in a long conversation with a local magistrate, and in discussions with other villagers. Hombolo Mission (for leprosy treatment) was also visited.

Data gathered on the questions of specific interest in Hombolo village:

1. Social Composition. This village is rather typical for Gogo in 1980. It has been greatly influenced by Tanzanian national policy and is heavily oriented in the division of "ujamaa" organization and politics. Former private enterprises (e.g., a few small shops, etc.) have been replaced by cooperatives. Most if not all Gogo now live in villages.

2. Ethnic Composition. Hombolo residents are primarily Gogo. A few people from other tribal groups have moved into the area--Zigua, Nguni, and some others. However, nearly all residents of the tarafa (administrative division) of Hombolo are ethnically Gogo.

3. Livelihood. The number of people working outside the tarafa is small. Most continue traditional activities of farming and herding and/or more recently introduced occupations (working for government, teaching in schools, etc.). Few people have been forced to move outside the area due to land shortage within the Hombolo administrative division--this fact contrasts with other areas of the country such as Kilimanjaro.

Shopkeeping is only done in Hombolo as a village cooperative enterprise. There are no private businessmen who own their own shops.

Craft industries are likewise limited in nature. Small craft industry is limited to blacksmithing, carpentry, and tourist items (carvings and other souvenirs) sold in Dodoma city.

Food and cash crops. Major food crops are maize and millet, while peanuts are a major cash crop. There are some sales of fish (from Hombolo Dam Reservoir), honey, milk and meat. However, all of this is in limited quantity and sold primarily within the Hombolo local area. Some limited amounts are sold outside but this is almost entirely limited to Dodoma city--where smoked fish from Hombolo Dam, for example, can be bought in the city market. Hides of the slaughtered animals are sold outside Hombolo.

4. Mobility. Few people work in wage earning occupations outside the area and few have left Hombolo to farm or herd elsewhere. Mobility of people is greatly affected by variations in annual rainfall patterns which have been considerable over the past few years.

Most children in schools study in local primary schools within reasonable walking distances. The mobility issue concerns teachers and school supplies rather than the students themselves directly. For all types of social services, the poor quality of the feeder roads in and out of the area means difficulty in transportation--especially in the rainy season.

The local market is small and inconsequential from the point of view of the road. The larger and more significant issue is access to cooperative society marketing boards which an improved road would facilitate. The major point is not lack of access of Hombolo to Dodoma, but the fact that travel is difficult in the rainy season, and therefore all social activities (health, education, marketing through cooperatives)

are to some degree affected. Transport to market is obtained through parastatal marketing authority vehicles (or independent truckers under contract) which come from Dodoma city to collect the goods which are produced locally. One bus passes through Hombolo every day (to and from Dodoma) and on three days goes beyond Hombolo Makulu to more distant villages. One privately-owned truck is available for hire in the Hombolo area and is frequently hired on a cooperative basis. The village of Hombolo itself does not own a truck. Hombolo Mission has a few vehicles which use the feeder roads.

5. Women. No special or unusual effects of the roads on women in this community which are different from other Tanzanian communities were observed.

6. Education. All schools in Hombolo are government schools. Primary schools are located throughout the area and it was estimated that no child probably has to walk for more than one-half hour to primary school. The age of beginning primary school varies--from as early as 7 years old to 15 or over. It was estimated that at least three-fourths of the population has good Swahili facility. With regard to adult education, local experts offer various courses--such as the agricultural officers on farming, the local teachers on literacy and language skills, and the Party leaders on politics. In addition, doctors give courses at the hospital every day on health (e.g., malaria, etc.).

The effect of improved roads on educational facilities would include, but not be limited to, the following: easier access of inspections to come and go by car or motorcycles; and to bring supplies for schools.

7. Social Services. The effect of improved feeder roads for Hombolo Makulu for all social services (health, water, government, etc.) would be similar to that expected for schools. It is primarily a matter of ease of access and all-weather access to the village. There was no indication that people are currently unable to sell their crops or livestock due to impassable roads. However, improved roads would simply facilitate all sorts of mobility into and out of the village.

8. Who will benefit? Since the community is largely unstratified, benefits of the road may be expected to be more or less evenly spread throughout. Villages or communities nearest the road would have greater access.

9. Manpower for road building and maintenance. There is considerable but not extreme interest and need for improved roads in this area.

With regard to manpower, three days per week (Mondays, Tuesdays, and Wednesdays) are given over to communal efforts. Some labor could be deployed easily in road maintenance. What was expressed as the greatest need was the assistance of experts to prepare roads and to offer help with serious maintenance matters. Routine maintenance could be easily incorporated in the communal labor efforts--as it is now done on a smaller scale.

2. Mvumi Village (Dodoma Rural District) March 14, 1980

A similar visit was made to Mvumi village on the afternoon of March 14. Most of the morning was spent in Dodoma obtaining permission from the district offices to make the visit. The visit to Mvumi differed from all others in that the social anthropologist was accompanied in this instance by a road inspector from the ComWorks Department.

1. Social Composition. Mvumi is a large ujamaa village with the communal shop, storehouse, government/Party offices, and a large community center located in a rather new building. Of all villages selected for intensive interviews, Mvumi was deemed to be the closest to the "model" outlined for ujamaa organization in national policy statements.

2. Ethnic Composition. Mvumi is located squarely in the middle of the traditional homeland of the Gogo people. Very few residents are not Gogo. Those who come from other ethnic groups typically are persons posted in the area due to occupation (teaching, government work, etc.). The community center is located near the home of a former Gogo chief. Otherwise, the ethnic composition is rather homogeneous and typical for Gogo at this point in Tanzanian history.

3. Livelihood.

Food and cash crops. The primary food and cash crop is millet, of which several varieties are grown. Other crops, but of lesser importance in quantity, are peanuts and maize. There is a definite preference for millet over maize as a food crop. It was estimated that only a small proportion of the villagers currently own cows (said to be around 5 per cent). There are ten plow oxen used in cooperative farming activities. The use of draft animals in cultivation is a recent introduction and not

a traditional custom of the Gogo. Hence, their use is limited in number and to communal, ujamaa activities.

Cattle and goats are herded near the village so that the milk can be consumed by local residents. In the dry season, however, it is necessary to send the animals southward to dry season grazing grounds (near Chiboli) where they are herded with animals from the other villages. A butchery is located in Mvumi. Four to five goats are butchered daily, and perhaps as many as three steers are butchered per week. Periodic sales of cows takes place through TLMC (Tanzania Livestock Marketing Company), but usually involves more villages than just Mvumi.

Shopkeeping. Mvumi has only one cooperative shop. There are no privately-owned shops in the village. Prior to villagization which began in 1972, there had been eight privately-owned shops in Mvumi. A visit to the cooperative shop revealed a reasonable supply of such items as bicycle tires, paper supplies, razor blades, flashlights, and other consumer goods.

Craft industry. Mvumi has no significant craft industry producing goods for sale outside the village. Bush knives, hoes, and other implements are produced within the village, and sale (or exchange through barter) of these items tends to be limited within the confines of the village itself. The only item which villagers reported as being sold outside for cash income is tanned hides from the animals which are butchered in the village.

4. Mobility. Many people from Mvumi have been educated and are therefore employed outside their home area as teachers, doctors, and so on. Quite a few former residents of the Mvumi area have moved away in search of farm land due to land scarcity in the area. There are no secondary schools nearby, so all students who study beyond the primary level must leave the area. Currently, two trucks serve Mvumi village, both are cooperatively owned. One of these is based in Mvumi and the other in Makoma. People living in other villages of the ward must hire trucks. It is often the case that several villages will cooperate in the hiring of trucks when they are needed for transportation purposes. Access to market is via the two trucks, one bus which serves Mvumi daily, and by the vehicles which come from the regional trading companies in Dodoma. There is a small village market in Mvumi which operates on a daily basis.

5. Women. Again, no unusual features of women's work were noted that would make Mvumi differ from the generalizations which would apply to roads and women's roles for most Tanzanian villages. The community center did contain a section devoted to women's sales of tea and ready-to-eat foodstuffs.

6. Education. Mvumi division has primary schools for all villages, amounting to about fifteen schools in the division. Prior to government administration of the primary educational system in Tanzania, there had been some mission schools in Mvumi division. With the change to local, universal primary education schools on a village-by-village basis, the mission schools were changed over to government schools. Much like Hombolo, children begin studying around 7 years of age or so, but this may be postponed for a few years. Again, like Hombolo, villagization has meant that few children have to walk very far to attend primary schools.

In vocational education, Mvumi had at one time a carpentry school, but it is currently not in operation. Villagers were uncertain about any plans to reopen it in the future. Beyond primary schools, there are no other special schools in the village or division.

Adult education is handled much like in Hombolo. Local teachers and other resident experts (whether in agriculture, politics, health, or other fields) give adult education courses to the villagers.

With regard to the relation between the schools and the poor quality of existing roads, villagers cited as major difficulties: receiving supplies on a timely basis and the difficulty of school inspectors visiting the local schools on a regular basis.

7. Social Services. The current status of major social services was summarized by village officials. In the area of water supplies, the village of Mvumi currently has several operating wells. In health, there is a government dispensary in the village as well as the Mvumi (Anglican) Hospital located about six miles from the center of Mvumi village. Both the local dispensary and the hospital have access to vehicles to transport supplies and sick persons. Regarding transportation facilities generally, villagers pointed out that the single bus and two trucks currently serving Mvumi on a regular basis are often insufficient to transport people and goods. The bus is often filled,

and people frequently are unable to travel on the days they might wish to do so. (The bus is owned by the Regional Cooperative Society and travels this route daily: Igandu to Mghaheze to Handali to Ndebwe to Mvumi Mission to Mvumi to Makulu to Makangwa to the main highway leading to Dodoma.)

8. Who will benefit? Again, due to the unstratified nature of Mvumi, increased transportation facilities in the form of better, all-weather roads and/or more vehicles would tend to generally benefit the community rather than any special interest groups.

9. Manpower for road building and maintenance. Similar answers were given to those reported under the description of Hombolo.

3. Goima Village (Kondoa District) March 16, 1980

The village of Goima in Kondoa district was visited on the afternoon of Sunday, March 16th. Travel from the base in Dodoma town to Kondoa as well as formalities in making the arrangements for visits to villages in Kondoa district precluded a longer visit on a week day. Although villagers were dispersed and most relaxing at home (or, in the case of a few old men, under a tree), the Village Chairman and several other villagers welcomed the visit and went to considerable lengths to explain the social situation and transportation facilities of Goima.

1. Social Composition. The village of Goima is organized along ujamaa principles. Residents number 948 people living in 454 separate households.

2. Ethnic Composition. Villagers are primarily Burungi in terms of their ethnic origin, with a small portion being Irangi. The Burungi people are non-Bantu and their traditional language is quite unlike Swahili. Nonetheless, many people spoke Swahili reasonably well. Some mention of the great cultural and linguistic differences between Burungi and the majority of Tanzanians was made during conversations with the villagers. The village is located near the border of the traditional homelands of the Burungi and Irangi people.

3. Livelihood. Most residents of the division were said to own livestock in varying numbers. In the Hamai region, maize is grown in greater quantity while the village of Goima itself grows maize and millet, both for food and as a cash crop when harvests are sufficient.

Less prominent crops in the area are some varieties of millet, sunflower, and castor beans. These crops along with honey, beeswax, and some livestock are the commodities which Goima villagers sell.

Shopkeeping. There are no private shops in Goima today. The only shop is the village cooperative.

Craft industry. The major craft industry in the village is pots, but most of these are produced for local use and not transported great distances for sale outside the Goima area.

Livestock. There is a monthly cattle sale arranged by TLMC where as many as two hundred head may be sold depending upon the season of the year. Milk sales in the local community are rare since nearly every family has its own cows. Herds were said to average about 30-40 cattle, 15-20 goats and sheep, along with a few donkeys. Slaughtering is not done on a commercial basis in Goima, but sick, old or dying animals may be butchered. Villagers will often offer an animal for sale to be slaughtered when they need cash for some special purpose. Except for the occasional visits of the livestock officers, villagers saw little connection between improved feeder roads and herding of livestock.

4. Mobility. Few Goima villagers work away from home. In contrast to some other villages which were visited, Goima residents have not left their own traditional homeland in search of better farming and grazing lands. Rather, they experienced an influx of Irangi people who moved into the Goima area during the 1954-59 period when destocking in nearby Irangi country was undertaken by the government. This accounts, at least in part, for the permanent residents of Goima village who are ethnically Irangi. As for students studying away from the community, villagers estimated that about seven young people are currently students at secondary (boarding) schools.

5. Women. No differences were noted for Goima from other villages visited.

6. Education. Since villagization, primary schools have been located within easy access for most residents of Goima. There are no secondary schools in Goima village or Kondoa district as a whole. The nearest secondary school is at Msalato near Dodoma. There is, however,

a teacher training college in the town of Kondoa. Regarding the distance villagers (children or adults) now have to walk to schools or adult education classes, a local school official estimated that the greatest possible distance (which would be rare) would be about six miles requiring about one and one-half hours in each direction. A more typical distance is a quarter of a kilometer to as much as two kilometers from schools--a distance which would account for the vast majority of villagers.

7. Social Services. In response to questions about social services and their association with transportation difficulties, some residents remarked that there is currently more money in Goima than there are commodities to spend it on. Shortages in the shop have been common for the last several years (at least, according to one village, since 1976).

Transportation difficulties in Goima stem from poor road beds (many large rocks), bad bridges, and infrequent assistance from ComWorks. The rains (during the period from December to as late as June) produce considerable transportation problems for villagers. Despite the poor quality of the roads, vehicles are currently able to pass throughout the year--although frequently the passage is slow and difficult.

A landrover is available for hire from the nearby mission. The Regional Trading Company vehicles comes frequently to Goima to collect cash crops.

In the health area, a landrover from Kondoa General Hospital provides medical supplies for the dispensary at Goima village. Many people were said to prefer the mission hospital. however, because they are able to get medical attention more quickly and generally believe its medical services are better.

There is one daily bus (privately owned) serving Goima. The route is from Kibaya to Fitetu to Kondoa and on to Arusha. It can carry about fifty-five passengers. Between June and November, when the crops are harvested and ready to be transported to market, many government vehicles and many privately-owned vehicles on hire by the government marketing companies come to Goima. This season of heaviest road use corresponds to the dry season.

8. Who would benefit? Goima villagers reported that the road

poses many problems during the rainy season. Nonetheless, it is generally possible to pass over it on an all-year basis. An improved all-weather access would benefit all villagers in providing more dependable and regular social services, connections to the outside world, and easier transport of goods and people.

9. Manpower for road building and maintenance. Reports of an interested potential labor pool for road building and maintenance were similar to those given in other villages visited.

4. Mungaa Village (Singida District) March 18, 1980

The primary persons interviewed at Mungaa village were the Village Secretary and an older villager. The older man was especially helpful in providing information from the point of view of an ordinary citizen who had lived through many types of changes in the community. The interview took place in the CCM (Party) Building.

1. Social Composition. Mungaa division contains 17 ujamaa villages. There are 956 adults (as enumerated by the village) currently residing in Mungaa itself. Every village in Mungaa division is organized as an ujamaa village or is in the process of becoming certified as an ujamaa village. No one lives outside a village at present. This pattern contrasts strongly with the dispersed settlement pattern prior to villagination of this area. Certification of a village means that the community can apply for government loans and assistance of various sorts.

2. Ethnic Composition. The village consists primarily of Nyaturu and Nyamwezi. There are a few people of other ethnic origins living in the village--about one-fourth of these are Chagga, others are Meru, Haya, and Nyakyusa. Most immigrants are involved in the following occupations: doctors, teachers, livestock, businesses, guest houses, etc. Since 1957 until now, these immigrants have been moving into Mungaa. These outsiders have only small kitchen gardens, and are not involved in any large-scale farming and/or herding.

3. Livelihood.

Subsistence. Primary food crops are sorghum (used to make porridge) and less important is maize meal (also used to make porridge), but in much smaller quantity. Three-fourths of the population is estimated to have their own cattle from which they obtain milk. Cattle

are grazed in family herds and put in night corrals connected with each household. In 1978, the village began a communal herding program for which 30 families contributed one cow each. Two bulls were added to the communal herd from Mpwapwa of the improved Mpwapwa breed. One bull died but the other is still alive. Eight calves have been born into the communal herd. The plan is to leave the calves in the communal herd until they have increased in number. In principle, the third calf will be returned to each original contributor of the cow. The community is involved in some cash cropping, shopkeeping, livestock sales, but very few people work for wages outside the community. The average herd at Mungaa contains 6-10 head of cattle and 10-20 head of sheep and goats. There are three cattle dips in the division. People use them frequently and like to do so because they worry about ticks as a disease vector for their livestock. There is a Veterinary Field Office in the village of Mungaa. Stock owners must pay for drugs used on their stock. Dipping at the cattle dips is free as is true for the entire country. Livestock population figures:

Animal	Mungaa Village
Cattle	1,626
Goats	971
Sheep	852

A few people from this village are working outside in government occupations. Perhaps as many as twenty students are studying in secondary schools outside the community.

Shopkeeping. There is one private shop in the Mungaa village which is operated by non-locals. There are 17 private shops in the entire division and 6 cooperative shops are located in villages in various parts of the division. This contrasts with some other villages which were visited and in which there are currently no private shops, although they existed prior to villagization.

Craft industries. The people make hoes, tools, etc. for local sales within Mungaa administrative division (that is, in the surrounding area) but not beyond it.

Cash cropping. For the entire division of Mungaa, the major cash crop is cotton. Others include sesame, castor beans (both for oil extraction elsewhere), bulrush millet, peanuts and sunflower seeds. A small amount of honey is collected (about 3/4 consumed and 1/4 sold).

Beeswax is sold in small amounts. Local beer is made from honey and/or millet, but not sold outside the village.

There is a cattle sale every month in the town center conducted by Tanzania Livestock Marketing Company (TLMC). The schedule is made out and known one year in advance. There is only one sales ring for the entire division which is located in Mungaa village itself. About one bovine is slaughtered monthly for local sale and consumption. Milk is generally available in sufficient quantity for all villagers throughout the year.

There are cooperative facilities for the collection and sale of castor beans, sunflower seed, cotton, peanuts and wax. There are three cooperative food markets at Ntuntu, Misughaa, and Makiungu. Small native markets operate periodically, but they were said to be small and rather insignificant. Household to household sales or exchanges of honey, milk, millet, and maize are common.

4. Mobility. Not many people work outside the community. This is not a "sending community" for labor in cities, nor do people from Mungaa seem to find it necessary to seek farming/herding opportunities outside the local areas. A few students are studying at secondary schools outside the community, but these again represent only a small fraction of the community population.

5. Women. No differences were noted for Mungaa from other villages visited.

6. Education. Mungaa, like all villages in Dodoma region, has universal primary schools which are generally available on a village-by-village basis. There are currently thirteen primary schools in the division. Some of the seventeen villages share schools. Due to remoteness of some of the villages, teachers experience considerable difficulty in transportation to and from certain of the schools. The most difficult school to reach by any means is Ntewa for which there is no road, only a foot path. A landrover can make it part of the way to the school, but some of the distance must be passed by foot. For Mnanne and Msule, there are no roads and no vehicles can reach them. Ntewa has ten teachers; Mungaa has twenty-two teachers; and many of the remotest village schools have as many as eight or nine teachers.

Many older people can generally read and write with some facility

in the Swahili language. Adult education classes include instruction in Swahili, reading and writing. It was estimated that three-quarters of the population can comprehend spoken Swahili with little or no difficulty.

One government secondary school is located in Singida town and another is located in Tumaini (Iramba district). The Ndumuni Roman Catholic Seminary is located on the Dodoma-Singida main road. Near Mungaa is a large technical secondary school which gives training in such occupational skills as carpentry, furniture making, electrical work, mechanical repairs, and the construction of modern house furnishings.

7. Social Services. The road is a problem for villagers and restricts movement in and out of the village. They are located 25 miles from the town of Singida. The major problems are transport of crops for sale outside the community (cited as problem of the first order) and transportation of people (especially for getting to medical facilities). Other problems associated with poor roads which were cited are the bringing of goods for sale within the community, and sometimes Party and government officials have difficulty reaching the village. Nonetheless, it is possible for CCM and government officials to manage to get into the village from as far away as Dar es Salaam. Government and private vehicles (all of which come from Singida town itself) are the sole means of transporting sale crops out of the community. The government transports crops by truck. The entire Mungaa district has one cooperative truck which is kept in Misughaa, which is at least 20 kilometers away. Private trucks are hired for transport by villagers.

There are four local roads within Mungaa district. One goes from Ntuntu to Mungaa, which was cited as the worst road. The main problems with this road are large rocky washes and that the bridges frequently fall into disrepair. At present, the road was deemed passable--but frequently during the rainy season it is impassable.

A second road goes from the Veterinary Center in Mungaa which joins the main road from Singida-Dodoma. This road is called the Makiungu Road.

Another road goes between Mungaa to Misughaa which has many streams and broken bridges, muddy stretches, and is mountainous. A landrover can always pass, but a bus cannot pass during the rainy season.

A fourth road (very bad condition) goes from Mungaa to the Seminary

Secondary School. The same problems as above occur here: rocks, bad bridges, muddy stretches, and mountains. It is eight miles to the Seminary from Mungaa, and this distance is usually passed on foot due to the bad road.

Two buses currently serve Mungaa village. These are:

(a) "Kinanda" Private Bus travels this route three times a week: Singida to Mungaa to Ntuntu one day; the next day it returns via this same route. There is no Sunday service. The bus is based in Singida.

(b) The other bus is cooperatively owned by Mtinko Coop. This bus passes through Mungaa en route to Singida town three times per week.

Villagers expressed the opinion that they would like to have their own cooperatively owned bus, as is true for some other wards.

The three dispensaries are located in Mungaa (where there are 956 adults), Ntuntu (684 adults), and Misughaa (755 adults). There is one Roman Catholic Mission Hospital in the division, located in a place which makes it difficult for many persons in the division to use its services. The hospital has one doctor and five assistants. The government sent two doctors to the hospital as well as one woman to operate a mother-child welfare clinic at the hospital. The Flying Doctor Service (based in Nairobi) comes on the second Tuesday of every month. There are two or three expatriate doctors who come from Nairobi monthly, who do what they can at the mission hospital or air lift patients to KCMC (Kilimanjaro Christian Medical Centre) at Moshi. Even though the mission hospital is difficult to reach for many people, it is preferred by many people who come from as far away as Singida town. The mission hospital is easier to use than the government hospital in Singida due to the fact that it is less crowded, easier to see doctors, and easier to find places to stay for relatives accompanying sick persons. This is true even though private hospitals charge for their services whereas government ones are free.

Water is a serious problem for Mungaa division. There are two villages with windmills. Fifteen villages do not have windmills. Where there are no windmills, they use hand-dug wells with draw buckets. This process of obtaining water is used both for human and animal needs.

Mungaa has one of the windmills. They water the livestock at the windmill pump and people obtain their water from this source as well. Kimbwi has a large dam and therefore many animals are herded near it.

The entire Misughaa ward has a serious water problem. There are no permanent boreholes. The streams dry up so that people must dig holes for water. Generally, people do not move outside for water during the dry season but rely on digging to obtain sufficient water. These statements refer primarily to the difficulties surrounding sufficient water for livestock in the dry season. In the dry season, they must often move the livestock into forest areas during the day for grazing and as a result the animals suffer from the type of sleeping sickness ("nzana") which does not affect humans.

8. Manpower for road construction and maintenance. The villagers reported that they are currently repairing their own roads and would maintain better, improved, or new roads as well. Transportation problems are serious for this community, and people seem predisposed towards helping maintain an improved feeder road system.

5. Nduguti Village (Iramba District) March 19, 1980

After formalities were completed with appropriate officials in Kiomboi concerning permission to visit villages in Iramba district, a visit was made to Nduguti and Kinyangiri villages on March 19. In Nduguti, information was provided by the Secretary of Nduguti ward, the Secretary of the village of Nduguti itself, and several villagers.

1. Social Composition. Like most other communities visited in Singida and Dodoma regions, Nduguti is organized as an ujamaa village. All people in Nduguti division were reported to live in ujamaa villages. In this particular village, there are few herders. Other villages within the district have many--especially the villages of Kinandili, Mwando, Ipuli, Kisuruiga, Mwanga, Singa, and Kidarafa.

2. Ethnic Composition. Most residents are ethnically Iramba. Very few non-Iramba people were said to live in Nduguti village. It was pointed out that the Iambi people are not located entirely within Iramba district: many live in Kurumi district as well. Villagers said that Iramba and Iambi are ethnically "the same people" with the major difference being that they use different languages.

3. Livelihood.

Food Crops. The primary food crop, preferred over all others, is millet. A little maize is grown, but in much less quantity. Cassava is also planted as a food crop as well as several varieties of beans which are eaten after being dried. Livestock are herded by most villagers.

Shopkeeping. There are twelve privately-owned and operated shops in Nduguti village. There is one cooperative shop, recently built and opened for business. Many of the shopkeepers are "Arabs" who have lived in the area for a long time. Some have married into the African population.

Craft industry. Small craft production for local sales takes place, but villagers reported that no crafts are produced for sale elsewhere.

Cash cropping and livestock sales. The primary cash crop for Nduguti is onions. Of lesser importance is sunflower production. Only small amounts of peanuts and millet are sold, although formerly peanuts were an important cash crop for the area. A local market operates daily in Nduguti village (although during the visit it was closed due to a cholera quarantine in Singida region). Also sold within Nduguti are fish brought from Lake Kitangiri by truck or bus. Fish from that lake are also taken on to Singida town where they are sold. Fish production in the general area of Nduguti also takes place in the Sibiti River, flowing between Lake Eyasi and Lake Kitangiri. Fish from the Sibiti River are taken by bus to Nduguti. At the local daily market in Nduguti village, in addition to fish, there are sales of such items as tomatoes, various fruits, cassava, and a few local crafts.

For both food and cash crop production, villagers pointed out the problems which are common as a result of highly variable and unpredictable rainfall patterns.

In cultivating, villagers sometimes hire privately-owned tractors. In addition to tractors which have only recently become available to villagers, plow oxen are used. Since 1965 when draft animals were introduced in the area, they have become so prevalent that they are estimated to be more common now than cultivation by hand alone. In the village of Nduguti, officials counted 407 work oxen and 130 ox plows. The idea of draft oxen was brought to this area from Sukuma country to the west. Weeding is still done with the hoe. Very few ox carts are used

for transportation of crops, although push carts are common. Some donkeys are used as pack animals. Donkey-drawn carts were known but they had not yet been made available in the village. Ox plows are sold in the village through the RTC.

A monthly livestock sale takes place in Nduguti under TLMC auspices, where as many as 100 cattle or more may be sold. A couple of steers are slaughtered weekly for local consumption.

4. Mobility. There is no land shortage requiring people to leave the area for farming or grazing land. However, there are some people who are away from the community in national service occupations and a few who have gone outside to farm. A few people have left Nduguti to farm elsewhere, but this is primarily due to a desire for better land rather than land shortage per se. A large number have emigrated to Mwanga and Kidarafa where they cultivate onions and maize. These two areas, in the Ndurumo River drainage zone, have "heavy black cotton soil," which holds moisture extremely well and is thus more fertile. These areas are near the traditional homeland of the Barabaig people who continue to subsist as herders and, according to informants, plant no crops.

From Nduguti, perhaps as many as one or two students per year go on to secondary school, usually at Singida Secondary School or Tumaini Secondary School in Iramba district. Near Tumaini are other educational facilities in which a few Nduguti villagers are involved from time to time: the Kinampanda Farmers Training Centre and the Tumaini Teachers Training College. These latter facilities, however, serve persons from quite distant places and in no sense should be considered local educational facilities within Iramba for the district's population.

5. Women. Similar to previously visited villages.

6. Education. Nduguti division contains nineteen villages, each of which has its own primary school used for educating children and for adult education classes. Children are all located close to primary schools since the advent of villagization. Since 1977, children have begun their schooling around seven years of age. Previously, entry was frequently postponed until age nine or later since the expectation that the child would study beyond four, or at most seven years, made this a rational strategy. Otherwise children completed their schooling while physically too immature to take up productive roles in the community.

Nearly all people, including women and old people, were said to have good Swahili language facility.

7. Social Services. Regarding the relation of roads to essential social services, villagers cited transportation of cash crops (primarily onion exports) on a regular and dependable basis as one of the most serious issues. The village has no cooperatively owned vehicles, but relies on two privately-owned trucks and private landrovers which may be hired. The RTC (Rural Trading Company) sends its vehicles to Nduguti to transport crops via the road which goes from Nduguti to Ikindiko to Senga to Kinyangiri to Iguguno and on to Singida town. The NMC (National Milling Company) collects crops at storehouses located at the following villages in Nduguti ward: Mwando, Iambi, Nduguti, Nkalankala, Malaja, Singa, Kidarafa, Mwanga, and Ilunda.

In discussing the current roads, village officials named these important roads serving Nduguti village: (1) a big road passing from Kinandili to Kisuruiga to Nduguti; (2) a road from Nduguti to Msingi; (3) a road connecting Nduguti with Mwanda; and (4) another road connecting Nduguti with Ipuli which goes on to Miganga and Kinandili. Small feeder roads are important in transporting crops to Nduguti, which is a collection point for trucks which come to collect cash crops.

In the ward, there are a total of seven trucks and two landrovers (all privately owned) which are for hire. Three bus routes serve the community. These are: (1) a cooperatively-owned bus company in Iramba district owns several buses which connect the villages with larger centers--the one serving Nduguti makes the round trip between Singida and Ibaga (passing through Nduguti) on a two-day cycle; (2) a privately-owned bus which connects Singida and Arusha passes twice a week through Nduguti; and (3) another private bus operated within Nduguti ward four times per week, running from Ibaga to Singida (via Nduguti).

Regarding health services, the people go to hospitals at Kiomboi and Nkungi (the latter is a Lutheran mission facility formerly devoted only to the care of leprosy). There is also a government dispensary located in Iambi. Preference was expressed for the mission hospital over the government facilities with the following reasons being given: ease of access, better service, and the belief that the medicines are better.

Water is a problem for Nduguti. The village has a windmill, a storage tank, and a diesel pump. The pipes have not yet been completed,

and people therefore still depend on boreholes for water. The Department of Water has mapped and planned the pipeline system for the village. The village has applied to the government for a loan to buy the pipeline. Currently, the windmill is used primarily for stock watering. Livestock also drink from the streams and anywhere else they are able to get water. Since there are not a lot of cattle in the village, the cattle can get enough water and do not have to be taken considerable distances from the village.

8. Who will benefit? The situation in Nduguti is similar to previously visited villages, although in this case the high level of production of cash crops for sale outside the local area indicated a significant need for dependable, all-weather roads for movement in and out of the village.

9. Manpower for road building and maintenance. The villagers reported that they do not have funds available for major repair work needed on the roads. Assistance of ComWorks was needed to make major repairs, to buy supplies for needed culverts, etc. They also cited the lack of trucks in the area which could be used to haul building materials. However, it was noted that unskilled human labor was plentiful.

6. Kinyangiri Village (Iramba District) March 19, 1980

After a lengthy interview in Nduguti village, a brief stop was made at Kinyangiri village where the Village Chairman was interviewed. The interview took place outside his house and was less comprehensive than most other interviews reported in this appendix. Most of the standard questions were not asked due to the very late hour when this visit was made, but the following facts--mostly having to do with livestock--were collected.

There are five villages in Kinyangiri division. The people of Kinyangiri village itself are primarily Iramba who are closely related culturally and linguistically to their neighbors, the Isanzu and Iambi peoples. Villagization began in 1975.

In 1971 and prior, the Village Chairman himself had 75 cattle. After that, he lost all but one calf. Whatever the disease or diseases (unknown by the informant) was, it is still prevalent in the following places: Kinyangiri, Ulasoni, Kyalonsangi, Maluga, Lyelembo, Kisamba, Iguguno. Of those places, it wipes out the cattle so badly that the

people cannot even keep plow oxen. Prior to 1971, people in these villages kept many cattle. Since 1971, the numbers have decreased to hardly none.

In describing the symptoms and the post mortem signs, it sounded like possibly babesiasis and East Coast Fever might both be implicated. The old man knew the term "ECF." He said they have some "tsetse." He also described the Brown Ear Tick, Amblyomma Tick, and described a tick which might be Boophilus decoloratus. (Brown Ear Tick is the primary vector of East Coast Fever.) Amblyomma is a common vector for anaplamosis in Tanzania. People of this village are dipping once a week in toxaphene dip wash which is not sufficient to stop an outbreak of ECF. Also, toxaphene resistance has been not infrequently encountered in Tanzania by Boophilus (the blue tick), the main vector for Bebesia.

Villagization started in 1975 and the relation between the diseases and villagization is unclear.

7. Makanda Village (Manyoni District) March 20, 1980

This village is located in the northernmost extension of the Bahi Swamp area. The interview took place in the Makanda Ward Offices.

1. Social Composition. Village officials reported that the population of Makanda is currently 1,602 people living in 435 households. They also gave the following figures: 372 men, 486 women, 393 male children, and 351 female children. There are 270 children in the local primary school, 754 adults in adult education classes, 125 members of the political party, and 38 labor union members. The animal census was reported as: 4,010 cows, 424 sheep, 1,020 goats, 75 donkeys, and 82 guard dogs (used primarily in protecting crops from wild animals, especially baboons). Makanda has been an ujamaa village since 1973 when the villagization process was begun in this area. There is only one village in this ward. Several neighboring villages are located in Kondoa district whose border lies close to the village of Makanda.

2. Ethnic Composition. The village is not ethnically homogeneous. It contains several people of the Sandawe tribe (who formerly were hunters and gatherers). A few Masai cultivate millet and keep livestock. About 3/4 of the people are Gogo, who cultivate millet and keep livestock.

3. Livelihood. About half of the Gogo do herding as well as farm. The remainder farm only. The Sandawe do not herd, but do a limited

amount of farming. The Masai all herd.

Food and Cash Crops. Villagers like to eat maize and millet, which are grown for food crops. At Kintinku, people eat a great deal of rice and sell the surplus. Most households cultivate two or three acres of rice so that there is not much left over for sale. At Makanda, a lot of millet is being grown this season and only a very small amount of rice is eaten. There are few other food crops. If there is a surplus of millet, it is sold. Typically, there is not sufficient quantity for sale in large amounts. They get very little milk--usually only enough for their daily tea. Ghee, livestock, and peanuts are sold.

The government trucks can reach the village to take the crops after the rains. The crops are collected in storehouses and then taken away later by the marketing companies. Although their ambition is to sell peanuts, they have not had good harvests.

Shopkeeping. Formerly there were private shops, but this is no longer the case. Currently there is one cooperative shop for the village. The shop sells food (such as flour, cornmeal, sugar, and oil), kerosene, clothes, etc. There is no tailor living in the village.

Craft industry. Nothing is made for sale outside the local area, but implements such as pots are made for local sale or trade. Very few pots are made because the clay is hard to get and it would also be hard to transport them outside the area.

4. Mobility. There is a very bad road connecting Makanda with Kintinku. Most of it is flooded under standing water during the rainy season and is impassable. The rains are usually from December through March or April. The difficulties include the facts that the road is of slippery white clay, there are poor culverts, and there are large flooded plains.

There are no trucks or small vehicles. Many people depend on bicycle for transportation. Others walk. In 1973, a bus started from Kintinku to Makanda. The route is: Makanda-Kintinku-Maweni-Chikuyu-Pandagani-Majiri-Ikasi-Isanza-Sanza. It goes one way each day and returns over this route the next day. The bus is owned cooperatively by villagers in the area. There is also a private bus which travels about the same route on alternate days. Many passengers disembark at Kintinku to go to Dodoma or Manyoni. There is an Anglican Mission Hospital at Kilimatinde. There

is a dispensary in Makanda village, but very sick persons are transported to the Christian hospital.

All people in Makanda live in villages. Nobody goes outside for business. People go out when the grass is dry--they may go as far as 8 to 10 miles for grazing. They may remain camped out there for as long as two months before returning to the village. There is one student studying outside at secondary school (who is currently in Form 1).

6. Education. Everyone, even old people, understands Swahili but not all are able to speak it. Most speak the Gogo language.

Basic education skills are provided to children, and to adults through the adult education facilities, in such courses as herding and farming practices. Those who teach adults have finished the seventh grade at the local primary school, and some local teachers are involved in adult education courses as are Party officials and others.

7. Social Services. There are two water pumps, approximately three miles away, and water has been piped to the village since 1974. Livestock water, however, is a problem. From July until the rains begin about December, they dig holes in the river bed. Depending on the distance and the amount of water, the livestock travel daily, twice daily, or stay a few days at a time at the water source during the dry season.

Other social services (transportation, education, health, etc.) have been discussed in previous comments.

8. Who would benefit? Since the ward has only one road which is impassable for large portions of the year, the entire population of Makanda would share in the benefits of an all-weather road. Of all the villages visited in the three regions, the transportation problems of Makanda villagers appeared to be among the most serious.

When asked what they need improved roads for, the answer was clear: during rains the roads are impassable. Greatest problems cited were getting to the hospital and transportation of people. It is sometimes a problem to get items for the crop shop to sell, but the road presents little difficulty regarding selling crops since they tend to be ready to be taken out during the dry season.

9. Manpower for road building and maintenance. The expressed desire for an all-weather road is great. Labor availability is similar to that of other villages.

8. Mlali Village (Mpwapwa District) March 21, 1980

The village of Mlali in Mpwapwa district was visited on the afternoon of March 21. In addition to villagers, the Village Secretary, a teacher, and the livestock field attendant provided information.

1. Social Composition. Mlali is a densely populated village in a fertile part of Mpwapwa district. It lies at the junction of two important rural roads and is therefore in more contact with the outside than some other communities which were visited.

2. Ethnic Composition. This village is ethnically heterogeneous and has been for a long time. About three-quarters of the people are Kaguru. Most of the rest are Gogo, a few Haya and others. For Mlali division as a whole, the ethnically Gogo villages include Mbori, Tambi, Mseta, Chankoroma, and Kongwa. Kaguru villages include Suguta, Mlali, Ihanda, Iduo and Ihongo.

3. Livelihood.

Food Crops. The prime crop is maize, while millet is secondary in importance. Other food crops are peanuts, beans, sweet potatoes, and cassava. Cash crops include peanuts, castor beans, sunflowers, and excess millet, sweet potatoes, corn, and cassava.

Shopkeeping. There are five shops, none of which is private. One is the large ward cooperative. There are two smaller village stores--one is operated by the young men of CCM, one is the Women's Coop (UWT). Previously, there were some private shops operated by Indians from Dar es Salaam and Mpwapwa. There were 11 such shops.

Craft industry. A few items are provided for local sales.

4. Mobility and Social Services. Not many children are studying outside the village in secondary schools. From this village alone, there would not be more than 10. For the entire division, there are probably 50-60 people studying in secondary schools. Since this is a large administrative division (comprised of 29 villages), this is a good indication of the small number of persons who study beyond the primary level in Tanzania.

There are two private vehicles in the village: one truck and one landrover.

Mlali is 18 miles from Gairo and 32 miles from Mpwapwa. There is a shorter road to Gairo, but it is not passable at present. Mlali

residents buy goods from stores in Mpwapwa. The road in disrepair is from Mlali to Pandambili. In the rainy season, it is always impassable. There is one bus (privately owned) which goes from Gairo to Pandambili daily. There is a cooperative bus which goes from Dodoma to Mlali and returns to Dodoma on a two-day schedule. Mlali is the turnaround point. The CCM and government officials can easily reach the village since they have landrovers, but if bridges are washed out or in disrepair they sometimes have difficulty. There is no secondary school here, but there is one in Mpwapwa. Access to adult education and primary education is easily available throughout the area. Sometimes they need supplies (such as books, etc.) for the schools, but they cannot always get them when needed due to bad roads. At Mlali Bondeni village, about three miles from Mlali, there is a Domestic Science Trade School. Everyone has lived in ujamaa villages since 1975. NMC (National Milling Company) trucks and GAPEX trucks come from Mpwapwa to collect crops. There is a rural health center in the village and a government hospital in Mpwapwa. The rural health center had a landrover but it is now broken. The very sick people now must travel to health facilities by bus. The nearest mission hospital is in Kilosa, but the road is too bad for people to go there.

Water is not a problem in this village. Fresh water from the mountain streams comes to the village by pipes. There are two livestock troughs (spring-fed) in the village. This village is fairly representative of the 26 villages in the division.

There are small roads connecting the villages of the division, but many are hard to pass. The main road in the division goes from Mpwapwa to Mbori to Chamkoroma to Suguta to Mlali. The people along the southeastern border of the division have only very small roads. Thus, they are in more contact with Morogoro district. The road from Mlali to Kongwa is impassable during the heavy rains. Essentially the only passable road during the rains is Mlali-Mbori-Mpwapwa.

Information on other points is discussed in the above paragraphs, or it should be assumed that no specific differences were noted between Mlali and villages which had been visited previously.

9. Mwanga Village (Mwanga District) January 4, 1980

Visits to the villages of Same/Mwanga in Kilimanjaro region were

made during January 1980 before the interview schedule was developed. Since the social anthropologist had lived nearly two years in the former Pare district (subdivided in 1979 into the districts of Mwanga and Same), he was able to use his prior knowledge of and familiarity with the area as a guide to asking questions about the social significance of roads in the communities of Same/Mwanga. The format for reports on these villages is somewhat different from those of Dodoma and Singida which were visited in March after the interview schedule was finalized.

Mwanga village is located at the point where the single access road connecting both Ugweno and Usangi divisions joins the main trunk road. It is now, and has been for quite some time, a crossroads village where the Pare people who reside in the North Pare Mountains wait for connecting buses to take them into the highlands or to some more distant point away from their highland homes. Traffic through Mwanga, both on the trunk road and into the North Pare highlands, is high by Tanzanian standards. One sees many buses, trucks, and even cars passing on the trunk road. Similarly, perhaps as many as a dozen daily buses pass through Mwanga on their way in and out of the highlands. Truck traffic is also heavy. Although the road is not fast, the volume of traffic is considerable given its condition. The road from Mwanga to the highlands was opened in 1936 and has been maintained, until recently, solely through local effort. In the past few years, some assistance from ComWorks has been available. The last ten years have seen a widening and a generally better maintenance of the road. Still, given the volume of traffic, there is considerable room for improvements through widening, repairing damaged sections, reinforcing portions which are subject to rain damage, etc.

Although Mwanga has some permanent residents, many highland Pares think of it as a "plains waystation." Even those who live there for economic reasons (shopkeeping, farming, etc.) may hold similar views. The Pare people think of themselves as "highland dwellers," and those who live or work in plains villages like Mwanga return to their highland homes frequently. The availability of daily bus service into the mountains makes this relatively easy nowadays. Even so, most parts of Usangi and Ugweno are not too distant from Mwanga to travel, if necessary, by foot.

The plains around Mwanga are generally better suited to herding than to farming. First of all, this area is generally drier and rainfall is not entirely dependable. Second, in the North Pare highlands,

land for cultivation is so scarce that it is rare for a family to keep more than a single cow. Such animals are used for milking and are, as is the custom on Mt. Kilimanjaro, stall fed rather than allowed to graze in the highlands. On the plains, by contrast, it is possible for the animals to be herded in larger numbers. Usually, several families combine herds and share in the work of herding the animals on the plains.

As is true for the Pare Mountains and other adjacent areas of northeastern Tanzania, the general level of education in this area exceeds that of the nation as a whole. Located on a nineteenth century caravan route between Tanga and Mt. Kilimanjaro, Mwanga has been exposed to outside influences for more than one hundred years. Fluency in Swahili is excellent by rural Tanzanian standards.

Social services are generally available to the residents of Mwanga village--although they would like to see improved water supplies and the like. Compared to most Tanzanian communities, access to transportation is not a problem for Mwanga residents. In 1980, a far greater problem than roads themselves is the lack of sufficient vehicles to transport people and goods. In January, it was possible to observe quite large numbers of people standing for considerable periods of time waiting for public transportation.

With the separation of Mwanga and Same into separate administrative divisions in mid-1979, it is expected that Mwanga village itself (the location of administrative headquarters for Mwanga division) will receive a great deal of concern with respect to the delivery of adequate social services. During the January 1980 visit, it was noted that the government offices were newly constructed and that virtually all records for the division were still housed in Same, location of the district headquarters for the former Pare district.

With respect to improved roads, Mwanga residents will not benefit directly nearly so much as residents of the highlands. Perceived needs are greater with regard to vehicles than roads for Mwanga residents per se. Although most Mwanga residents make their living in farming, herding, or shopkeeping, finding people to work on road construction and maintenance should not be a problem.

10. Usangi and Ugweno (Mwanga Division) January 4-5, 1980

Two visits were made on the afternoons of January 4 and 5 to the

villages of Usangi and Ugweno in the North Pare Mountains (Mwanga division). As was the case with the village of Mwanga, no formal questionnaire was used since it had not yet been developed. However, since the social anthropologist had lived in Usangi for nearly one year (during 1967-68 and 1972), he was able to contact a number of former acquaintances as well as current government and Party officials, and to discuss general matters pertaining to needed road improvements and their likely benefits for these communities. These findings are summarized in the paragraphs which follow.

Both Ugweno and Usangi share a common road which leaves the trunk road at Mwanga and climbs from there into the highlands. It then divides with one branch heading to Ugweno and the other to Usangi.

1. Social Composition. In contrast to a decade ago, North Pare contains many cooperative endeavors. Previously, this had been an area where individual enterpreneurship had been encouraged, petty capitalism was the rule, and some individuals might have even been considered "wealthy" by East African standards. Thus, the change to more cooperative activities in marketing, shopkeeping, and in other areas of life is a significant change for these people. To the casual outside observer, the lack of such obvious ujamaa activities as one finds in Dodoma and Singida regions might lead to the hasty and erroneous conclusion that this area lacks cooperative enterprises. A more appropriate measure would be the distance each area has come toward meeting national goals from the place where it started. For both Usangi and Ugweno, movements toward more collective activities have been great. It should be noted, however, that this is an area where "ujamaa in the villages" (Swahili: ujamaa vijijini) rather than "ujamaa villages" (Swahili: vijiji vya ujamaa) is more prevalent. Throughout the Pare Mountains, people continue to live in dispersed settlements scattered throughout the habitable portions of the mountains and concentrated, rather densely, at those elevations where crops grow best, rainfall and groundwater are plentiful, and the climate is benign.

2. Ethnic Composition. Both Usangi and Ugweno are ethnically "Pare." Prior to European contact, the two groups had not been united, nor did they speak a common language. The colonial era caused old differences to be forgotten as the people of both North and South Pare found

it useful to amalgamate themselves into a single "tribe." Thus, today all indigenous residents of the North and South Pare Mountains call themselves "Pares" without reservations. Minor differences do exist in customs, but these are similar to those found in other so-called tribes within Tanzania.

3. Livelihood. North Pare residents depend on plantains and maize for primary food crops. Other crops such as millet and cassava are grown and used for food as well. It is customary for each household to keep a milch cow which is stall-fed near the kitchen. These animals, when old, are slaughtered for meat. Small amounts of cash crops are grown in the highlands: coffee, cardamom, bananas and plantains--but there is not a great deal of land in the highlands themselves for cash crop production. The plains, especially to the northeast of the mountains, are used for growing additional food and cash crops and, in the arid areas, for herding livestock. Shopkeeping during the late 1960s was so prevalent in the highlands that the social anthropologist, as part of his work at that time, estimated that there was about one shop for every fifty households. The large number of adult men engaged outside the highlands in cash earning occupations was a far more important source of income than the cash crops and also a reason why shops are so prevalent. Changes during the 1970s in shopkeeping have introduced some cooperative shops, although many private ones remain. Availability of goods for purchase was cited as a problem by many villagers--a problem stemming from the national economy rather than the state of the roads to and from the highlands per se. Cash cropping, as noted, is more limited than the sale of another important commodity--labor.

It is difficult to estimate the number of people residing outside their highland homes today, although in 1968 this was estimated to be as great as one in three. No reliable statistics on wage employment outside the highlands exist for the current period, although villagers state that many people still work away from home. This is due both to the fact that people in these communities have come to depend on outside employment for supplemental income and that there is not sufficient land for the needs of all persons who would claim Usangi and Ugweno as "home." The large number of buses, trucks, and vehicles which move in

and out of the highlands daily attest to the high degree of population movement which continues to be a vital part of the lifestyle of North Pare residents. North Pare residents produce a few pots which are sold in markets as far away as Arusha and Babati (with most probably going to Moshi). This is the major craft industry of the area, but earnings from pottery account for only a small portion of the economy of these villages. It should be noted, however, that women are the producers of these pots and that it is men, not women, who sell labor outside the highlands. Cash cropping is engaged in by both men and women.

4. Mobility. Adequate measures of mobility are not available. Relying simply on the sales figures for cash crops would give only a small portion of the total picture of mobility in the highlands. There are several reasons for this. First, most villagers have small farms at several locations on the mountain slopes and are consequently "mobile" in their subsistence and cash cropping activities. Second, the movement of people, unlike that of crops, is exceptionally hard to document.

5. Women. Unlike villages in most of Dodoma and Singida regions, Pare women are greatly affected by the current mobility patterns and thus the roads in the area. Many husbands, fathers and brothers work away from home. From time to time, wives and children may join their husbands/fathers in the cities or places where they work. More typically, other family members remain at home caring for the family farm while the husband/father earns wages to supplement the family income. In turn, these wages provide the cash which women in the villages use to purchase goods (food supplies, cloth, kerosene, etc.) in the local shops. Thus, roads are an important lifeline for Pare families. They provide a means for men to get to their cash earning occupations outside the highlands as well as a means to transport into the villages the commodities which their families purchase. Thus, the relationship is a complex one--with all residents dependent on the roads for movement of people, commodities to be purchased in local shops, and sale of cash crops. Roads are an important economic lifeline for North Pare residents which connect their rural homeland to the larger economic system.

6. Education. Primary schools are available throughout the Usangi and Ugweno highlands. There are also some private secondary schools, operated by TAPA (Tanzania Parents Association) in the area. In the 1960s,

access to schools was considered by many Pares to be a more serious matter with regard to upper primary and secondary schools since for many of these people it would be unthinkable that children did not attend primary school. Preference had been given in the past to attempting to educate males over females, especially in the upper grades and in secondary schools--since educational attainments could be directly correlated with better jobs.

7. Social Services. The last decade has been one of rapid progress in the increase of social services for the people of North Pare. The last year or so has brought telephone service, while electricity is expected within another year or two. Cleaner and better water supplies have become widely available, reducing the probability of water as a disease vector and at least some of the former workload on women whose job it was to haul water for the daily needs of their families. A government hospital is located in Usangi and a reasonably well-stocked dispensary is in Ugweno. Both villages have access to government offices, postal services, political party officers and community education programs. Transportation is available in the form of buses, trucks, and vehicles.

8. Benefits of improved roads. For the highland communities of North Pare, the most important aspect of improved rural roads would be improved--not new--access. In tandem with this, many villagers feel that more and better vehicles are the other side of the coin, and an equally critical component in improving transportation services for their communities. In addition to the main access roads of Usangi and Ugweno which link with the trunk road at Mwanga, there are several other roads which are either currently passable during only some portions of the year or, which, if built and kept in workable, all-weather condition, would greatly increase the ease of highlanders in moving people and goods in and out of their villages. An example of the latter type of road is that connecting Butu (on the northeastern plains) with the North Pare highlands. Currently, people either must walk to their farms at Butu, or at harvest, make an exceedingly long trip by vehicle via Mwembe and Lembeni to pass over a poor quality road on the plains. This latter situation is expensive in both time and money, but is used by some villagers in lieu of the alternative--transport of crops on the heads

of women, one basketful at a time.

9. Manpower. Although many villagers work outside the highlands and must continue to find some sort of supplementary financial support for their families, this labor pool is likely to be responsive to needs for construction and maintenance of roads in the highlands. In addition, residents of Usangi and Ugweno are accustomed to self-help maintenance projects. After all, they are pleased to remind any inquiring outsider, they built the road themselves and have maintained it for over forty years with virtually no help from the outsiders.

11. and 12. Gonja Bombo and Mbaga Manka (Same Division) January 6, 1980

The highland communities of Gonja Bombo and Mbaga Manka were visited on Sunday, January 6. As was the case for Usangi, the interview schedule had not yet been developed, so interviews were less structured and more free-ranging. A variety of people in both Gonja and Mbaga provided much helpful information. In addition, the social anthropologist had also lived in Mbaga for nearly one year (1968 and 1972) and was thus familiar with the social situation in the South Pare Mountains.

1. Social Composition. As in the case of North Pare, South Pare villages have a number of cooperative enterprises but are not organized as compact settlements as in the case of the ujamaa villages common to Dodoma and Singida regions. Land is generally more available in South Pare and thus fewer people have found it economically necessary to seek supplementary wage earning activities outside the highlands. Cash cropping (especially coffee) is a more common means than wage labor to supplement subsistence farming activities.

2. Ethnic Composition. Virtually everyone residing in the highland communities of South Pare is ethnically "Pare." There is less diversity among these communities than is found in the highlands of North Pare, making this an especially homogeneous cultural region.

3. Livelihood. Food and cash crops are similar to North Pare. A major difference between highland communities in South Pare and those in the North Pare Mountains is that livestock are kept in greater (but not especially large) numbers. Instead of being stall-fed, most animals are taken to pasture in the highlands. There are many privately-owned shops, as well as some cooperative ones, but in contrast to North Pare,

villagers here rely less on buying than producing what they need. There are no significant craft industries which produce goods for sale beyond the local communities.

4. Mobility. Although Gonja Bombo and Mbaga Manka do have residents who work outside, sell cash crops which are grown in the highlands, and bring in goods for sale in the local shops, there are no regular transportation services which link these highland communities with either the unpaved road on the eastern side of the South Pare Mountains or the main trunk road on the western side. In order to get to public transportation, villagers must walk a distance of several miles from their homes in the highlands to wait for buses at Kisiwani or other points on the plains. Since buses are somewhat undependable, the distance plus the wait makes this an arduous task. (For additional comments about the present condition of the roads and their social consequences, see section 8.)

5. Women. Since the question regarding both Gonja and Mbaga is the development of an all-weather access road with regular transportation facilities where none presently exists, the impact of such a road and regular transportation facilities would affect the lives of both men and women. For men who work away from home, and for those who sell cash crops, better, more dependable roads would facilitate access to places of work, help get needed assistance (supplies and expertise) for cash crops into the area, and provide a more reliable means of transporting goods to market. For women, the consequences are likely to be even more significant. Since women do most of the transportation within the farm area of crops and goods sold in the shops, the availability of transportation facilities would ease this burden. On the other hand, women earn money by transporting goods on their heads, and the replacement of their labor by vehicles would mean a loss of this income. Precisely how much this is or how important it is in the family budget is difficult to estimate. This is, however, one negative consequence of replacing transportation by humans with mechanized transport. In other areas of their lives, women are likely to benefit from some of the consequences of better transportation facilities--easier access to hospitals, community development programs, and the like.

6. Education. Like the residents of North Pare, villagers in

South Pare are relatively well educated by Tanzanian standards. There are several private secondary schools in the area. Transportation is more a problem for the students in these schools (many come from considerable distance to boarding schools here), for teachers (who depend on supplies from the outside), for supervisors, etc. Highland areas of South Pare have ready access to primary schools. In addition, there are many adult education classes.

7. Social Services. Social services (water, health, public transportation, etc.) would greatly benefit from the existence of a dependable road and regular transportation services (see section 8).

8. Benefits of improved roads. In order to demonstrate the significance of roads to the villagers of Gonja and Mbaga, I have abstracted the following comments from a letter written to me by a teacher following my visit. I had asked the teacher about roads and the social significance of them for South Pare communities. The teacher was an old friend (from previous work I had done in the area in 1968) and wrote the following thoughts to me to include in my report. Including them in the words of the teacher, rather than paraphrasing them, will give the reader a better sense of how the villagers see the significance of roads for their communities.

> "Here are some thoughts on why the road from Same (via Mwembe) to Mbaga and Gonja should be improved. I'll try to list the reasons I can think of so they can be used in the report."
>
> "1. If the road is improved, there will be more people ready to bring their buses and (trucks)--they now fear the bad road as it is destructive to vehicles."
>
> "2. Farmers have many things to sell, not only coffee and cardamom. The food products like bananas, cassava, a variety of fruits, etc. would find a market in Same. As a result, there would be more production of these things and the people would have a regular source of income to raise the standard of living. Just now the cash crops are sold at certain times of year when they are ready. For those who have no knowledge of budgeting, it means they do not have money throughout but only when they sell their crops."
>
> "3. The dispensary is small and keeps referring patients to Moshi, Same, Dar es Salaam, etc. Such find it very difficult to travel--sometimes they have to be carried

to Kisiwani--almost 9 miles away where there are buses. If the road were good and vehicles available, things would be much better for such patients."

"4. The schools, especially the Secondary School at Manka, need transport for supplies. Food and all the other requirements are brought in large amounts regularly. There is a lot of money spent on hiring vehicles to bring these things--in some cases, especially during the rainy season, the school gets stranded as the road becomes impassable for heavy vehicles. Besides, for emergency, there is no way of moving fast out of Mbaga to outside areas except through Kisiwani."

"5. There is a post office here. This operates only twice a week because the postman has to walk to Kisiwani. Letters which are urgent are delayed, while, if the road were good and there were vehicles on the road, it would be possible to get mail up here daily."

"6. Overall with the conditions of such roads improved production of all agricultural things around is likely to rise because people will be able to sell all their products. At the moment, there's lots of wastage because of lack of market--mainly because of poor transportation. Generally, therefore, people are not encouraged to rise above the subsistence level."

TABLE A-V-1

FOOD CROP PURCHASES, DODOMA RURAL DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

No.	Division	Crop and Year: Maize 77/78	Maize 78/79	Maize 79/80	Sorghum 77/78	Sorghum 78/79	Sorghum 79/80	Bulrush Millet 77/78	Bulrush Millet 78/79	Bulrush Millet 79/80
1	Itiso	545	1,392	559	236	484	55	351	191	4
2	Chamwino	6	17	56	376	1,048	788	20	53	19
3	Mvumi	-	1/	43	172	210	635	4	1	4
4	Mwitikira	1/	44	203	35	202	-	7	94	1/
5	Chipanga	1/	137	-	6	339	11	1/	111	-
6	Bahi	-	-	-	44	150	11	-	2	-
7	Makangwa	-	4	26	20	1,265	943	2	65	1
8	Mundemu	10	6	-	47	249	5	40	51	-
	Total	561	1,600	887	936	3,947	2,448	424	568	28

No.	Division	Crop and Year: Finger Millet 77/78	Finger Millet 78/79	Finger Millet 79/80	Other 2/ 77/78	Other 2/ 78/79	Other 2/ 79/80	Total 77/78	Total 78/79	Total 79/80
1	Itiso	198	102	80	24	-	5	1,354	2,169	704
2	Chamwino	1/	1/	1/	48	-	15	450	1,118	878
3	Mvumi	1/	-	-	31	-	28	207	211	710
4	Mwitikira	-	-	1/	12	-	1/	54	340	203
5	Chipanga	-	1/	1	20	-	7	26	587	19
6	Bahi	-	1/	-	9	-	-	53	152	11
7	Makangwa	-	1/	-	18	-	8	40	1,334	978
8	Mundemu	15	18	-	45	-	-	157	324	5
	Total	213	120	81	207	-	63	2,341	6,235	3,508

1/ Less than 0.5 metric tons.

2/ Includes cowpeas, paddy, beans, and mung beans.

Source: Data compiled from records of National Milling Corporation (NMC), Dodoma Branch.

TABLE A-V-2

FOOD CROP PURCHASES, DODOMA URBAN DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

		Crop and Year								
		Maize			Sorghum			Bulrush Millet		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Hombolo	1/	2	1	15	309	46	1/	19	-
2	Kikombo	-	-	1/	20	100	96	1	-	1
3	Nala	-	-	-	5	14	-	6	1/	-
4	Mpunguzi	-	-	-	20	62	24	1	1	-
	Total	1/	2	1	60	485	166	8	20	1

		Crop and Year								
		Finger Millet			Other 2/			Total		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Hombolo	1	2	1	26	-	8	42	332	56
2	Kikombo	-	-	1/	1	-	2	27	100	99
3	Nala	-	1/	-	3	-	-	14	14	-
4	Mpunguzi	-	-	-	4	-	3	25	63	27
	Total	1	2	1	39	-	13	108	509	182

1/ Less than 0.5 metric ton.

2/ Includes pigeon peas, lima beans, cowpeas, beans, and mung beans.

Source: Data compiled from records of National Milling Corporation (NMC), Dodoma Branch.

TABLE A-V-3

FOOD CROP PURCHASES, MWAPWA DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

		Crop and Year								
		Maize			Sorghum			Bulrush Millet		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Mpwapwa	772	2,308	831	130	874	756	16	326	33
2	Kibakwe	3,799	5,533	4,300	95	709	300	7	88	6
3	Mlali	6,685	6,946	3,668	686	1,814	449	986	1,182	22
4	Zoissa	5,433	10,905	5,583	1,929	2,323	218	2,428	1,835	63
5	Kongwa	1,147	2,605	2,053	438	1,652	662	1,003	1,156	32
6	Rudi	68	426	14	190	1,577	238	3	47	1/
	Total	17,904	28,723	16,449	3,468	8,949	2,623	4,443	4,634	156

		Crop and Year								
		Finger Millet			Beans including limas			Other 2/		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Mpwapwa	1	8	10	6	3	32	508	172	9
2	Kibakwe	14	37	10	123	134	119	318	229	9
3	Mlali	18	39	3	13	1	54	684	431	118
4	Zoissa	26	33	14	-	-	2	196	229	43
5	Kongwa	10	16	1/	-	-	3	554	431	140
6	Rudi	4	16	8	81	59	85	76	97	2
	Total	73	149	45	223	197	295	2,336	1,589	321

TABLE A-V-3

FOOD CROP PURCHASES, MWAPWA DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

No.	Division	Total 77/78	Total 78/79	Total 79/80
1	Mpwapwa	1,433	3,691	1,671
2	Kibakwe	4,356	6,730	4,744
3	Mlali	9,072	10,413	4,314
4	Zoissa	10,012	15,325	5,923
5	Kongwa	3,152	5,860	2,890
6	Rudi	422	2,222	347
	Total	28,447	44,241	19,889

1/ Less than 0.05 metric ton.
2/ Includes pigeon peas and cowpeas, among other unidentified crops.

Source: Data compiled from the records of the National Milling Corporation (NMC), Dodoma Branch.

TABLE A-V-4

FOOD CROP PURCHASES, KONDOA DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

		Crop and Year								
		Maize			Sorghum			Pigeon peas		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Kondoa Mjini	89	381	217	84	421	103	-	-	64
2	Mondo	31	723	1,258	463	1,710	701	-	-	293
3	Farkwa	2	-	-	44	5	2	-	-	1
4	Kwamtoro	-	-	-	6	9	-	-	-	-
5	Pahi	26	342	1,124	1,527	3,359	1,312	-	-	813
6	Goima	602	1,319	2,525	201	977	318	-	-	47
7	Bereko	682	656	852	1,992	3,545	1,929	-	-	1,793
8	Kolo	290	497	279	124	684	215	-	-	645
	Total	1,722	3,918	6,255	4,441	10,710	4,580	-	-	3,656

		Crop and Year								
		Bulrush Millet			Finger Millet			Beans		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Kondoa Mjini	101	413	12	103	242	82	-	1	3
2	Mondo	1,759	2,721	104	633	1,086	462	1/	4	57
3	Farkwa	27	-	-	22	12	16	-	-	-
4	Kwamtoro	2	22	-	20	57	-	-	-	-
5	Pahi	1,069	1,355	155	266	492	54	28	27	310
6	Goima	1,099	1,156	41	803	1,414	286	6	55	188
7	Bereko	637	407	95	257	471	55	14	9	213
8	Kolo	143	95	38	272	600	260	1	1	52
	Total	4,837	6,169	445	2,376	4,374	1,215	49	97	823

TABLE A-V-4

FOOD CROP PURCHASES, KONDOA DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

		Crop and Year					
		Other 2/			Total		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80
1	Kondoa Mjini	145	70	33	522	1,528	522
2	Mondo	535	67	30	3,421	6,311	2,905
3	Farkwa	1	-	1/	96	17	19
4	Kwamtoro	7	1/	-	35	88	-
5	Pahi	782	258	39	3,698	5,833	3,807
6	Goima	125	9	5	2,836	4,930	3,410
7	Bereko	419	912	11	4,001	6,000	4,948
8	Kolo	244	311	36	1,074	2,188	1,527
	Total	2,258	1,627	154	15,683	26,895	17,138

1/ Less than 0.05 metric ton.

2/ Includes lima beans, cowpeas, and cassava, among other unidentified crops.

Source: Data compiled from records of National Milling Corporation (NMC), Kondoa and Dodoma offices.

TABLE A-V-5

CASH CROP PURCHASES, DODOMA RURAL DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

		Crop and Year								
		Ground Nuts			Castor Seed			Sunflower		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Itiso	1/	1	7	11	41	8	1	3	6
2	Chamwino 2/	6	4	47	27	16	14	2	4	9
3	Mvumi	1	-	47	34	11	28	2	1/	10
4	Mwitikira	1/	1/	-	1	1	-	-	-	-
5	Chipanga	1/	3	73	1/	1/	1/	-	-	1/
6	Bahi	2	1	20	-	1/	1/	-	-	-
7	Makangwa	1	-	42	14	-	26	1/	-	-
8	Mundemu	10	2	3	9	5	1	1	1	1
	Total	20	11	239	96	74	77	6	8	26

		Crop and Year								
		Sesame			Beeswax			Gum Arabic		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Itiso	3	2	2	6	4	1	4	1/	-
2	Chamwino 2/	23	38	46	1	1	2	2	1/	1/
3	Mvumi	1	-	2	1/	1/	1/	1/	-	-
4	Mwitikira	1	-	-	1/	1	-	10	6	-
5	Chipanga	1	1	1/	1	1/	2	30	14	1/
6	Bahi	1/	2	1	1/	1/	1/	-	1/	-
7	Makangwa	1/	-	-	1/	-	-	1/	-	-
8	Mundemu	19	13	8	4	2	1	3	2	-
	Total	48	56	59	12	8	6	49	22	1/

TABLE A-V-5

CASH CROP PURCHASES, DODOMA RURAL DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

No.	Division	Total 77/78	Total 78/79	Total 79/80
1	Itiso	25	51	24
2	Chamwino 2/	61	63	118
3	Mvumi	38	11	87
4	Mwitikira	12	8	-
5	Chipanga	32	18	75
6	Bahi	2	3	21
7	Makangwa	15	-	68
8	Mundemu	46	25	14
	Total	231	179	407

1/ Less than 0.05 metric ton.
2/ Also known as Chilonwa.

Source: Data compiled from the records of General Agricultural Products Export Corporation (GAPEX), Dodoma Branch.

TABLE A-V-6

CASH CROP PURCHASES, DODOMA URBAN DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

		Crop and Year								
		Ground Nuts			Castor Seed			Sunflower		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Hombolo	-	1/	7	1/	8	6	-	1/	1
2	Kikombo	-	-	-	1/	2	-	-	1/	-
3	Nala	-	-	1/	-	2	1	-	1/	1/
4	Mpunguzi	-	-	-	-	2	1/	-	-	-
	Total	-	1/	7	1/	14	7	-	1/	1

		Crop and Year								
		Sesame			Beeswax			Gum Arabic		
No.	Division	77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Hombolo	1	18	16	1/	1/	1	2	1	-
2	Kikombo	1	1	1	-	1/	-	-	1	-
3	Nala	-	1	1	-	1/	1/	-	1/	-
4	Mpunguzi	-	-	1/	-	1	1/	-	1/	-
	Total	2	20	18	1/	1	1	2	2	-

		Total		
No.	Division	77/78	78/79	79/80
1	Hombolo	3	27	31
2	Kikombo	1	4	1
3	Nala	-	3	2
4	Mpunguzi	-	3	1/
	Total	4	37	34

1/ Less than 0.5 metric ton

TABLE A-V-7

CASH CROP PURCHASES, MWAPWA DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78 AND 1979/80

(METRIC TONS)

No.	Division	Crop and Year							
		Ground Nuts		Castor Seed		Sunflower		Sesame	
		77/78	79/80	77/78	79/80	77/78	79/80	77/78	79/80
1	Mpwapwa	61.2	274.6	61.5	21.3	122.6	77.5	8.0	10.2
2	Kibakwe	38.2	111.9	39.9	38.7	15.9	228.8	-	0.3
3	Mlali	52.6	57.6	267.1	285.5	130.8	319.9	1.2	-
4	Zoissa	14.5	33.1	80.4	35.8	39.7	38.3	5.4	1.0
5	Kongwa	33.4	282.8	260.5	264.8	1.4	125.7	0.6	1.8
6	Rudi	32.4	254.0	3.5	12.0	1.0	1.3	0.2	0.3
	Total	292.3	1,014.0	712.9	658.1	311.4	791.5	15.4	13.6

No.	Division	Crop and Year					
		Beeswax		Gum Arabic		Total	
		77/78	79/80	77/78	79/80	77/78	79/80
1	Mpwapwa	0.6	0.2	-	-	253.9	386.0
2	Kibakwe	0.2	0.2	-	-	94.2	381.1
3	Mlali	0.8	1.8	0.5	-	453.0	667.3
4	Zoissa	1.2	4.2	-	-	141.2	173.9
5	Kongwa	0.4	1.2	-	-	356.3	678.5
6	Rudi	-	-	-	-	37.1	269.5
	Total	3.2	7.6	0.5	-	1,335.7	2,556.3

Source: Data for 1977/78 are compiled from records of National Milling Corporation (NMC), Mpwapwa Branch, while those for 1979/80 are compiled from records of General Agricultural Products Export Corporation (GAPEX), Dodoma Branch.

TABLE A-V-8

CASH CROP PURCHASES, KONDOA DISTRICT, DODOMA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

No.	Division	Crop and Year: Ground Nuts 77/78	Ground Nuts 78/79	Ground Nuts 79/80	Castor Seed 77/78	Castor Seed 78/79	Castor Seed 79/80	Sunflower 77/78	Sunflower 78/79	Sunflower 79/80
1	Kondoa Mjini	-	1/	1/	15	17	7	79	148	144
2	Mondo	-	1	1/	110	58	15	388	1,018	770
3	Farkwa	-	-	-	1/	-	1/	-	-	1
4	Kwamtoro	-	-	-	2	4	5	1/	1/	1
5	Pahi	-	-	1/	260	117	14	326	509	429
6	Goima	-	-	1/	31	42	17	19	48	68
7	Bereko	-	1/	1/	99	26	8	149	144	52
8	Kolo	1/	1/	1	41	25	5	92	181	160
	Total	-	1	1	558	289	71	1,053	2,048	1,625

No.	Division	Crop and Year: Sesame 77/78	Sesame 78/79	Sesame 79/80	Beeswax 77/78	Beeswax 78/79	Beeswax 79/80	Total 77/78	Total 78/79	Total 79/80
1	Kondoa Mjini	2	1	1	-	-	2	96	166	154
2	Mondo	13	11	3	-	-	6	511	1,088	794
3	Farkwa	-	-	-	-	-	1	1/	1/	2
4	Kwamtoro	1/	-	-	-	-	3	2	4	9
5	Pahi	8	6	1	-	-	2	594	632	446
6	Goima	1/	1/	1/	-	-	1	50	90	86
7	Bereko	9	5	3	-	-	1	257	175	64
8	Kolo	1	1/	1	-	-	1	134	206	168
	Total	33	23	9	-	-	17	1,644	2,361	1,723

1/ Less than 0.5 metric ton.

Source: Data compiled from records of National Milling Corporation (NMC), Kondoa Branch for 1977/78 and 1978/79, and from records of General Agricultural Products Export Corporation (CAPEX)

TABLE A-V-9

FOOD CROP PURCHASES, SINGIDA RURAL DISTRICT, SINGIDA REGION, BY CROPS AND ADMINISTRATIVE DIVISIONS, 1978/79 AND 1979/80

(METRIC TONS)

No.	Division	Crop and Year: Maize 78/79	Maize 79/80	Sorghum 78/79	Sorghum 79/80	Bulrush Millet 78/79	Bulrush Millet 79/80	Finger Millet 78/79	Finger Millet 79/80
1	Ihanja	1/	1	14	28	8	1	122	140
2	Ikungi	3	-	46	7	3	-	173	184
3	Mungaa	-	-	18	-	2	-	187	106
4	Mtinko	527	113	469	51	35	1/	332	231
5	Mgori	-	-	47	6	14	-	235	144
6	Ilongero	471	253	809	139	15	-	734	553
	Total	1,001	367	1,403	231	77	1	1,783	1,368

No.	Division	Crop and Year: Beans including limas 78/79	Beans including limas 79/80	Other 2/ 78/79	Other 2/ 79/80	Total 78/79	Total 79/80
1	Ihanja	1/	2	7	16	151	188
2	Ikungi	1	4	14	9	240	204
3	Mungaa	1/	1	5	3	212	110
4	Mtinko	2	13	7	28	1,372	436
5	Mgori	16	22	5	8	317	180
6	Ilongero	74	96	14	52	2,117	1,093
	Total	92	138	52	116	4,409	2,211

1/ Less than 0.5 metric ton.

2/ Consists of pigeon peas, cowpeas, cassava, peas and mung beans.

Source: Data compiled from records of National Milling Corporation (NMC), Singida Branch.

TABLE A-V-10

FOOD CROP PURCHASES, IRAMBA DISTRICT, SINGIDA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1978/79 AND 1979/80

(METRIC TONS)

No.	Division	Crop and Year: Maize 78/79	Maize 79/80	Sorghum 78/79	Sorghum 79/80	Bulrush Millet 78/79	Bulrush Millet 79/80	Finger Millet 78/79	Finger Millet 79/80
1	Kirumi	-	-	78	21	8	-	3/	1
2	Nduguti	594	207	426	22	52	3/	65	59
3	Kinyangiri	106	9	175	15	17	-	16	17
4	Kinampanda	11	3/	49	7	12	-	4	2
5	Kisiriri	3/	3/	1	-	3	-	1	3/
6	Ndago	-	4	67	19	29	1	2	12
7	Shelui	-	1	-	3/	-	-	-	-
	Total	711	221	796	84	121	1	88	91

No.	Division	Crop and Year: Peas 1/ 78/79	Peas 1/ 79/80	Other 2/ 78/79	Other 2/ 79/80	Total 78/79	Total 79/80
1	Kirumi	3/	5	3/	-	86	27
2	Nduguti	43	105	7	5	1,187	398
3	Kinyangiri	5	12	2	2	321	55
4	Kinampanda	5	7	1	4	82	20
5	Kisiriri	11	33	1	4	17	37
6	Ndago	6	19	2	6	106	61
7	Shelui	3	20	-	2	3	24
	Total	73	201	13	23	1,802	622

1/ Includes pigeon peas and cowpeas.
2/ Consists of beans and mung beans.
3/ Less than 0.5 metric ton.

Source: Data compiled from records of National Milling Corporation (NMC), Singida Branch.

TABLE A-V-11

FOOD CROP PURCHASES, MANYONI DISTRICT, SINGIDA REGION, BY CROPS AND ADMINISTRATIVE DIVISIONS, 1978/79 AND 1979/80

(METRIC TONS)

No.	Division	Crop and Year							
		Maize		Sorghum		Bulrush Millet		Finger Millet	
		78/79	79/80	78/79	79/80	78/79	79/80	78/79	79/80
1	Manyoni	-	-	-	-	-	-	-	-
2	Itigi	94	8	48	21	15	6	37	77
3	Manyoni Vijijini	-	-	-	-	-	-	-	-
4	Kintinku	-	-	20	-	-	-	-	-
5	Nkonko	459	30	188	52	58	-	17	12
	Total	553	38	256	73	73	6	54	89

No.	Division	Crop and Year			
		Peas 1/		Total	
		78/79	79/80	78/79	79/80
1	Manyoni	-	-	-	-
2	Itigi	2	30	196	142
3	Manyoni Vijijini	-	-	-	-
4	Kintinku	27	-	47	-
5	Nkonko	14	37	736	131
	Total	43	67	979	273

1/ Includes pigeon peas and cowpeas.

Source: Data compiled from records of National Milling Corporation (NMC), Singida Branch.

TABLE A-V-12

CASH CROP PURCHASES, SINGIDA RURAL DISTRICT, SINGIDA REGION, BY CROPS AND ADMINISTRATIVE DIVISIONS, 1978/79 AND 1979/80

(METRIC TONS)

No.	Division	Crop and Year: Ground Nuts 78/79	Ground Nuts 79/80	Castor Seed 78/79	Castor Seed 79/80	Sunflower 78/79	Sunflower 79/80	Gum Arabic 78/79	Gum Arabic 79/80
1	Ihanja	-	1/	1	1	22	23	1/	1/
2	Ikungi	-	-	2	3	10	37	1	-
3	Mungaa	3	1	3	3	17	34	-	-
4	Mtinko	1	1/	5	4	9	113	2	1/
5	Mgori	3	-	1	2	7	30	-	-
6	Ilongero	-	-	1	3	4	34	1	1
	Total	7	1	13	16	69	27	4	1

No.	Division	Crop and Year: Other 2/ 78/79	Other 2/ 79/80	Total 78/79	Total 79/80
1	Ihanja	1/	1	23	25
2	Ikungi	-	-	13	40
3	Mungaa	1/	-	23	38
4	Mtinko	2	1	19	118
5	Mgori	1/	-	11	32
6	Ilongero	2	2	8	40
	Total	4	4	97	293

1/ Less than 0.5 metric ton.

Source: Data compiled from records of National Milling Corporation (NMC), Singida Branch.

TABLE A-V-13

CASH CROP PURCHASES, IRAMBA DISTRICT, SINGIDA REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1978/79 AND 1979/80

(METRIC TONS)

No.	Division	Crop and Year: Ground Nuts 78/79	Ground Nuts 79/80	Castor Seed 78/79	Castor Seed 79/80	Sunflower 78/79	Sunflower 79/80	Sesame 78/79	Sesame 79/80
1	Kirumi	1	3	-	-	27	247	9	7
2	Nduguti	4	5	2	2	433	1,310	-	-
3	Kinyangiri	9	2	2	1	93	227	-	-
4	Kinampanda	6	1	1/	1	176	257	-	-
5	Kisiriri	3	5	1/	1/	9	39	-	10
6	Ndago	1	1/	-	-	2	237	2	1
7	Shelui	1	2	-	-	-	18	1/	1
	Total	25	18	4	4	740	2,335	11	19

No.	Division	Crop and Year: Other 2/ 78/79	Other 2/ 79/80	Total 78/79	Total 79/80
1	Kirumi	1	-	38	257
2	Nduguti	2	1	441	1,318
3	Kinyangiri	2	1/	106	230
4	Kinampanda	1/	1	182	261
5	Kisiriri	-	4	12	58
6	Ndago	4	1/	9	238
7	Shelui	1	1/	2	21
	Total	10	5	790	2,383

1/ Less than 0.5 metric ton.
2/ Consists of beeswax, bambara nuts and gum arabic.

Source: Data compiled from records of National Milling Corporation (NMC), Singida Branch.

TABLE A-V-14

CASH CROP PURCHASES, MANYONI DISTRICT, SINGIDA REGION, BY CROPS AND ADMINISTRATIVE DIVISIONS, 1978/79 AND 1979/80

(METRIC TONS)

No.	Division	Crop and Year: Ground Nuts 78/79	Ground Nuts 79/80	Castor Seed 78/79	Castor Seed 79/80	Sunflower 78/79	Sunflower 79/80
1	Manyoni	-	-	-	-	-	-
2	Itigi	1/	1/	1/	-	2	16
3	Manyoni Vijijini	-	-	-	-	-	-
4	Kintinku	1	-	-	-	-	-
5	Nkonko	6	3	-	1/	-	-
	Total	7	3	1/	1/	2	16

No.	Division	Crop and Year: Other 2/ 78/79	Other 2/ 79/80	Total 78/79	Total 79/80
1	Manyoni	-	-	-	-
2	Itigi	8	3	10	19
3	Manyoni Vijijini	-	-	-	-
4	Kintinku	5	-	6	-
5	Nkonko	-	3	6	6
	Total	13	6	22	25

1/ Less than 0.5 metric ton.

2/ Consists of beeswax, bambara nuts, gum arabic and rice.

Source: Data compiled from records of National Milling Corporation (NMC), Singida Branch.

TABLE A-V-15

FOOD CROP PURCHASES, SAME DISTRICT, KILIMANJARO REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

No.	Division	Crop and Year								
		Sorghum			Beans			Paddy		
		77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Same	15.5	39.0	-	0.2	25.7	19.0	-	4.0	-
2	Mwembe Mbaga	-	22.3	-	50.7	79.0	179.0	243.3	17.5	4.0
3	Gonja	10.5	6.9	-	45.2	102.8	155.0	503.0	87.4	108.0
4	Chome/Suji	17.2	128.0	-	-	47.7	51.0	-	-	-
5	Mamba Vunta	-	-	-	-	1.0	-	-	-	-
6	Ndungu	-	4.6	-	-	118.6	63.0	-	15.3	11.0
	Total	43.2	200.8	-	96.1	374.8	467.0	746.3	124.2	123.0

No.	Division	Crop and Year								
		Lima Beans			Rice			Other 1/		
		77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Same	-	7.1	-	-	-	-	39.3	26.9	-
2	Mwembe Mbaga	-	-	-	530.6	88.1	1.0	0.8	0.1	-
3	Gonja	-	-	-	450.0	296.3	-	-	0.8	-
4	Chome/Suji	1.9	160.3	-	-	-	-	-	8.4	-
5	Mamba Vunta	-	-	-	-	-	-	-	-	-
6	Ndungu	-	-	-	-	225.6	1.0	-	3.0	-
	Total	1.9	167.4	-	980.6	610.0	2.0	40.1	39.2	-

TABLE A-V-15

FOOD CROP PURCHASES, SAME DISTRICT, KILIMANJARO REGION, BY MAJOR CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80 (METRIC TONS)

No.	Division	Total 77/78	Total 78/79	Total 79/80
1	Same	55.0	102.7	19.0
2	Mwembe Mbaga	825.4	207.0	184.0
3	Gonja	1,008.7	494.2	263.0
4	Chome/Suji	19.1	344.4	51.0
5	Mamba Vuni	-	1.0	-
6	Ndungu	-	367.1	75.0
	Total	1,908.2	1,516.4	592.0

1/ Consists of pigeon peas, cowpeas and mung beans.

Source: Data compiled from records of National Milling Corporation (NMC), Same Branch, Kilimanjaro.

TABLE A-V-16

FOOD CROP PURCHASES, MWANGA DISTRICT, KILIMANJARO REGION, BY CROPS AND ADMINISTRATIVE DIVISIONS, 1977/78, 1978/79, 1979/80

(METRIC TONS)

No.	Division	Crop and Year								
		Sorghum			Cowpeas			Beans		
		77/78	78/79	79/80	77/78	78/79	79/80	77/78	78/79	79/80
1	Ugweno	3.3	94.0	-	13.8	68.4	-	19.1	2.2	1.0
2	Usangi	-	0.2	-	-	1.3	-	18.6	20.1	44.0
3	Mwanga	-	12.0	-	-	40.7	-	-	13.3	31.0
4	Lembeni	-	3.3	-	-	103.2	-	-	23.6	25.0
	Total	3.3	109.5	-	13.8	213.6	-	37.7	59.2	101.0

No.	Division	Crop and Year					
		Other 1/			Total		
		77/78	78/79	79/80	77/78	78/79	79/80
1	Ugweno	12.3	11.5	-	48.5	176.1	1.0
2	Usangi	8.9	0.9	-	27.5	22.5	44.0
3	Mwanga	-	2.8	-	-	68.8	31.0
4	Lembeni	-	13.8	-	-	144.1	25.0
	Total	21.2	29.0	-	76.0	411.5	101.0

1/ Consists of maize, pigeon peas and mung beans.

Source: Data compiled from records of National Milling Corporation (NMC), Same Branch.

TABLE A-V-17

CASH CROP PURCHASES, SAME DISTRICT, KILIMANJARO REGION, BY CROPS AND ADMINISTRATIVE DIVISIONS, 1976/77, 1977/78, 1978/79 (METRIC TONS)

		Crop and Year								
		Cardamom			Castor Seed			Sunflower		
No.	Division	76/77	77/78	78/79	76/77	77/78	78/79	76/77	77/78	78/79
1	Same	0.1	1.4	2.0	7.2	8.7	28.4	0.4	1.6	5.8
2	Mwembe Mbaga	-	-	-	2.7	-	-	0.2	-	-
3	Gonja	8.4	10.7	35.8	0.1	0.6	0.4	-	1/	0.2
4	Chome/Suji	1.4	0.2	0.1	4.2	1.4	1.3	0.1	0.1	0.5
5	Mamba Vunta	2.5	2.0	6.0	-	1/	-	-	-	1/
6	Ndungu	-	-	-	-	-	-	-	-	0.1
	Total	12.4	14.3	43.9	14.2	10.7	30.1	0.7	1.7	6.6

		Crop and Year					
		Gum Arabic			Total		
No.	Division	76/77	77/78	78/79	76/77	77/78	78/79
1	Same	9.1	8.5	1.9	16.8	20.2	38.1
2	Mwembe Mbaga	-	-	-	2.9	-	-
3	Gonja	-	0.1	1/	8.5	11.4	36.4
4	Chome/Suji	0.9	0.2	-	6.6	1.9	1.9
5	Mamba Vunta	-	-	-	2.5	2.0	6.0
6	Ndungu	-	-	-	-	-	-
	Total	10.0	8.8	1.9	37.3	35.5	82.4

1/ Less than 0.5 metric ton.

Source: Data compiled from records of General Agricultural Products Export Corporation (GAPEX), Same Branch.

TABLE A-V-18

CASH CROP PURCHASES, MWANGA DISTRICT, KILIMANJARO REGION, BY CROPS AND ADMINISTRATIVE DIVISIONS, 1976/77, 1977/78, 1978/79

(METRIC TONS)

No.	Division	Crop and Year: Cardamom 76/77	Cardamom 77/78	Cardamom 78/79	Castor Seed 76/77	Castor Seed 77/78	Castor Seed 78/79	Sunflower 76/77	Sunflower 77/78	Sunflower 78/79
1	Ugweno	0.7	0.6	1.7	0.2	4.2	1.6	2/	1.7	2.4
2	Usangi	0.2	0.6	1.0	3.1	1.1	1.6	2/	0.6	5.3
3	Mwanga	-	-	-	-	-	-	-	-	-
4	Lembeni	-	-	2/	2.9	-	9.6	0.6	-	0.3
	Total	0.9	1.2	2.7	6.2	5.3	12.8	0.6	2.3	8.0

No.	Division	Crop and Year: Cowpeas 76/77	Cowpeas 77/78	Cowpeas 78/79	Other 1/ 76/77	Other 1/ 77/78	Other 1/ 78/79	Total 76/77	Total 77/78	Total 78/79
1	Ugweno	-	21.8	-	-	9.3	0.1	0.9	37.6	5.8
2	Usangi	-	2/	-	0.1	2/	2/	3.4	2.3	7.9
3	Mwanga	-	-	-	-	-	-	-	-	-
4	Lembeni	5.8	-	-	1.8	-	2/	11.1	-	9.9
	Total	5.8	21.8	-	1.9	9.3	0.1	15.4	39.9	23.6

1/ Consists of gum arabic, mung beans and soybeans.
2/ Less than 0.1 metric ton.

Source: Data compiled from records of General Agricultural Products Export Corporation (GAPEX), Same Branch.

TABLE A-V-19
LIVESTOCK CENSUS FOR DODOMA RURAL DISTRICT BY ADMINISTRATIVE DIVISION, 1978

Division	Cattle	Goats	Sheep
		(No. of Head)	
Itiso	44,774	15,859	11,356
Chamwino	69,395	38,957	25,472
Mvumi	36,264	20,109	7,323
Mwitikira	49,349	8,249	16,735
Chipanga	92,227	34,313	22,086
Bahi	78,584	31,498	14,514
Makangwa	81,324	19,537	12,239
Mundemu	55,517	21,013	7,268
Total	507,434	189,535	116,993

Source: Compiled from official census records provided by the District Livestock Officer, Dodoma Rural District.

TABLE A-V-20
LIVESTOCK CENSUS FOR DODOMA URBAN DISTRICT BY ADMINISTRATIVE DIVISION, 1978

Division	Cattle	Goats	Sheep
		(No. of Head)	
Hombolo	44,786	24,131	5,177
Kikombo	25,995	20,858	4,016
Nala	24,794	10,763	5,805
Mpunguzi	17,473	11,840	2,809
Total	113,048	67,592	17,807

Source: Compiled from official census records provided by the District Livestock Officer, Dodoma Urban District.

TABLE A-V-21
LIVESTOCK CENSUS FOR MPWAPWA DISTRICT, DODOMA REGION, BY ADMINISTRATIVE DIVISION, 1978

Division	Cattle	Goats	Sheep
	(No. of Head)		
Mpwapwa	60,355	42,278	21,124
Kibakwe	43,561	17,928	6,581
Mlali	38,643	23,192	10,066
Zoissa	15,796	9,518	3,274
Kongwa	32,758	18,085	8,864
Rudi	39,440	34,784	17,530
Total	230,553	145,785	67,439

Source: Compiled from official census records provided by the District Livestock Officer, Mpwapwa District.

TABLE A-V-22
LIVESTOCK CENSUS FOR KONDOA DISTRICT, DODOMA REGION, BY ADMINISTRATIVE DIVISION, 1978

Division	Cattle	Goats	Sheep
	(No. of Head)		
Kondoa Mjini	13,924	16,145	5,315
Mondo	29,062	34,654	14,039
Farkwa	26,738	11,607	9,140
Kwamtoro	37,899	18,417	12,175
Pahi	38,769	28,298	18,219
Goima	39,616	26,615	6,865
Bereko	38,929	28,735	10,816
Kolo	27,100	30,508	21,778
Total	252,037	194,979	98,347

Source: Compiled from official census records provided by the District Livestock Officer, Kondoa District.

TABLE A-V-23
LIVESTOCK CENSUS FOR SINGIDA RURAL DISTRICT, SINGIDA REGION, BY ADMINISTRATIVE DIVISION, 1978

Division	Cattle	Goats	Sheep
	(No. of Head)		
Singida Rural			
Ihanja	33,471	29,772	9,919
Ikungi	46,143	30,462	17,081
Mungaa	25,508	19,361	9,343
Mtinko	90,770	41,334	28,944
Mgori	26,385	18,981	9,190
Ilongero	77,661	27,691	23,727
Subtotal	299,938	167,601	98,204
Singida Urban	38,904	21,722	10,674
Total Singida Rural and Urban	338,842	189,323	108,878

Source: Compiled from official census records provided by the District Livestock Officer, Singida Rural District

TABLE A-V-24
LIVESTOCK CENSUS FOR IRAMBA DISTRICT, SINGIDA REGION, BY ADMINISTRATIVE DIVISION, 1978

Division	Cattle	Goats	Sheep
	(No. of Head)		
Kirumi	36,685	34,940	21,291
Nduguti	53,565	22,588	17,549
Kinyangiri	35,379	25,715	13,307
Kinampanda	40,955	30,912	12,921
Kisiriri	40,313	28,884	20,354
Ndago	77,156	27,896	12,166
Shelui	44,261	17,521	13,488
Total	328,314	188,456	111,076

Source: Compiled from official census records provided by the District Livestock Officer, Iramba District.

TABLE A-V-25
LIVESTOCK CENSUS FOR MANYONI DISTRICT, SINGIDA REGION, BY ADMINISTRATIVE DIVISION, 1978

Division	Cattle	Goats	Sheep
	(No. of Head)		
Manyoni	7,625	2,491	615
Itigi	22,720	8,256	2,575
Manyoni Vijijini	11,911	4,752	3,748
Kintinku	32,795	8,086	4,700
Nkonko	36,636	17,767	8,201
Total	111,687	41,352	19,839

Source: Compiled from official census records provided by the District Livestock Officer, Manyoni District.

TABLE A-V-26
LIVESTOCK CENSUS FOR SAME DISTRICT, KILIMANJARO REGION, BY ADMINISTRATIVE DISTRICT, 1978

Division	Cattle	Goats	Sheep
	(No. of Head)		
Same	31,121	43,674	26,266
Mwembe Mbaga	33,151	28,234	11,849
Gonja	2,635	1,332	1,272
Chome/Suji	30,676	30,097	18,683
Mamba Vunta	7,770	9,379	5,018
Ndungu	25,654	17,433	14,697
Total	131,007	130,149	77,785

Source: Compiled from official census records provided by the District Livestock Officer, Same District.

TABLE A-V-27
LIVESTOCK CENSUS FOR MWANGA DISTRICT, KILIMANJARO REGION, BY ADMINISTRATIVE DISTRICT, 1978

Division	Cattle	Goats	Sheep
	(No. of Head)		
Ugweno	8,302	11,957	4,724
Usangi	14,838	16,003	7,201
Mwanga	19,045	18,164	5,740
Lembeni	33,659	30,275	12,611
Total	75,844	76,399	30,276

Source: Compiled from official census records provided by the District Livestock Officer, Mwanga District.

TABLE A-VI-1

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selected for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road By Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Dodoma Rural							
Itiso	Cheneme-Itiso-Izava	21,977	79	100	79	1,736,183	
	Trunk Road - Msanga-Chilonwa-Dabalo-Itiso	24,366	98	71	70	1,705,620	
	Hombolo-Meia Meia	23,410	52	13	7	163,870	
	Itiso-Haneti	24,844	33	100	33	819,852	
	Haneti-Humekwa	24,844	19	100	19	472,036	
	Itiso-Zajilwa	24,844	15	100	15	372,660	
	Dabalo-Manyembe	24,366	20	100	20	487,320	
Total or Average					243	5,757,541	23,693
Chamwino	Msanga-Chilonwa-Dabalo-Itiso	24,366	98	29	28	682,248	
	Trunk Road - Kikombo-Handali	24,366	27	19	5	121,830	
	Chilonwa-Chinangali-Majeleko	24,366	8	100	8	194,928	
	Trunk Road - Msanga	23,888	13	29	4	95,552	
Total or Average					45	1,094,558	24,324
Mvumi	Mlowa Barbarani-Idifu	24,366	20	31	6	146,196	
	Nghahelezi-Igandu	24,844	10	100	10	248,440	
	Dodoma-Mvumi-Nkulabi	24,366	41	11	5	121,830	
	Trunk Road - Kikombo-Handali	24,366	27	19	5	121,830	
	Handali-Kitemo	24,844	29	80	23	571,412	
Total or Average					49	1,209,708	24,688
Mwitikira	Mpunguzi-Mwitikira-Mpwayungu	21,977	40	88	35	769,195	
	Nghome-Mwitikira	24,366	30	72	22	536,052	
	Mpwayungu-Ruzi-Ilangali	24,366	60	100	60	1,461,960	
	Ruzi-Chinungulu	24,366	29	100	29	706,614	
	Ruzi-Chifutuka	24,844	15	74	11	273,284	
					157	3,747,105	23,867
Chipanga	Chidilo-Chipanga-Chali-Ikasi	21,499	34	88	30	644,970	
	Mkonze-Chidilo-Nondwa	24,366	52	62	32	719,712	
	Chali-Chikopero-Chipanga	21,499	29	100	29	623,471	
	Chigongwe-Kigwe-Ngulugano-Chipanga	22,932	36	45	16	366,912	
	Nghome-Mwitikira	24,366	30	28	8	194,928	
	Ruzi-Chifutuka	24,844	15	26	4	99,376	
	Nondwa-Chifutuka	24,844	20	100	20	496,880	
Total or Average					139	3, 146,249	22,635
Bahi	Kigwe-Mpinga-Ngulugano	28,666	17	88	15	429,990	
	Chigongwe-Kigwe-Ngulugano-Chipanga	22,932	36	52	19	435,708	
	Lamaiti-Mkakatika-Bahi	26,277	40	64	26	683,202	
	Mbalawala-Mindi	22,932	24	100	24	550,368	
Total or Average					84	2,099,268	24,991
Makangwa	Mlowa-Barbarani - Idifu	24,366	20	69	14	341,124	
	Dodoma-Mvumi - Nkulabi	24,366	41	11	5	121,830	
	Gulwe-Fufu	24,366	64	16	10	243,660	

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selected for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road By Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Mendemu	Iazaiti-Mkakatika-Bahi	26,277	40	36	14	367,678	
	Mundemu-Iazaiti	26,277	30	100	30	788,310	
	Mbalawala-Mundemu-Mzakwe	22,932	20	93	19	435,708	
Total or Average					63	1,591,896	25,268
Dodoma Urban							
Hombolo	Makutapora-Chihanga-Gawaye	26,277		100	28	737,756	
	Hombolo Dam-Mycko-Kawawa	23,688	16	100	16	362,208	
	Hombolo-Zeplaa	23,688	10	100	10	238,880	
	Ipala-Chahwa-Vikonje	23,688	14	100	14	334,432	
	Trunk Road-Hombolo-Mela Mela	23,410	52	87	45	1,053,450	
	Trunk Road-Msanga	24,366	13	71	9	219,264	
Total or Average					122	2,966,020	24,312
Kikombo	Ntyuka-Cholole	26,277	27	100	27	709,479	
	Dodoma-Mvumi-Nkulabi	24,366	41	74	29	706,614	
	Trunk Road-Kikombo-Handali	24,366	27	62	17	414,222	
Total or Average					73	1,830,315	25,073
Nala	Nala-Zuzu	22,932	10	100	10	229,320	
	Zuzu-Mbabala	22,932	20	23	5	114,660	
	Nala-Mbalawala	22,932	10	100	10	229,320	
	Chipongwe-Kigwe-Ngulugano-Chipanga	22,932	36	3	1	22,932	
	Mbalawala-Mundemu-Mzakwe	22,932	20	7	1	22,932	
Total or Average					22	619,614	22,932
Mpunguzi	Zuzu-Mbabala	22,932	20	77	15	343,980	
	Dodoma-Mvumi-Nkulabi	24,366	41	4	2	48,732	
	Mzonze-Chidilo-Nondwa	24,366	52	38	20	487,320	
	Mpunguzi-Mwitikira-Mpuayungu	21,977	40	12	5	109,885	
Total or Average					42	989,917	23,569

TABLE A-VI-1

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selected for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road By Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Mpwapwa							
Mpwapwa	Nghambi-Mpwapwa-Mlali	23,649	81	92	75	1,773,675	
	Mpwapwa-Gulwe	21,977	15	100	15	329,655	
	Matomondo-Godegode	21,977	16	100	16	351,632	
	Chunyu-Maagali	21,977	10	100	10	219,770	
	Gulwe-Rudi	22,932	74	14	10	229,320	
	Gulwe-Furu	24,366	64	84	54	1,315,764	
	Godegode-Mbuga	22,932	75	12	9	206,388	
	Igoji-Mtamba	24,366	30	40	12	292,392	
	Handali-Kitemo	24,844	29	20	6	149,064	
Total or Average					207	4,867,660	23,515
Kibakwe	Gulwe-Rudi	22,932	74	62	46	1,054,872	
	Kibakwe-Mwana Wota	24,366	23	100	23	560,418	
	Godegode-Mbuga	22,932	75	88	66	1,513,512	
Total or Average					135	3,128,802	23,176
Mlali	Nghambi-Mpwapwa-Mlali	23,649	81	8	6	141,894	
	Mlali-Pandambili	23,410	24	100	24	561,840	
	Kongwa-Suguta	21,927	40	33	13	285,051	
Total or Average					43	988,785	22,995
Zoissa	Trunk Road - Zoissa	21,927	63	75	47	1,030,569	
Total or Average					47	1,030,569	21,927
Kongwa	Trunk Road-Kongwa	21,977	3	100	3	65,931	
	Kongwa-Suguta	21,977	40	67	27	593,379	
	Trunk Road-Vilundilo	21,977	10	100	10	219,770	
Total or Average					40	879,080	21,977
Rudi	Gulwe-Rudi	22,932	74	24	18	412,776	
	Kibakwe/Rudi Road-Massa-Idoloma	24,844	78	100	78	1,938,232	
	Rudi-Chipogoro	24,844	37	100	37	919,028	
	Igoji-Mtamba	24,366	30	60	18	438,588	
Total or Average					151	3,685,424	24,407

TABLE A-VI-1

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selected for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road By Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Kondoa							
Kondoa	Bicha-Dalai-Tandala-Kolo	26,993	84	4	3	80,979	
	Bicha-Kondoa	20,066	3	100	3	60,198	
	Kondoa-Kwamtoro	22,932	56	32	18	412,776	
Total or Average					24	563,953	23,486
Mondo	Arna-Chandama-Mrijo Chino	22,932	48	20	10	229,320	
	Jangalo-Tandala	29,621	21	75	16	473,936	
	Chandama-Jangalo	43,954	12	31	4	175,816	
	Bicha-Dalai-Tandala-Kolo	26,993	84	33	28	755,804	
Total or Average					58	1,634,876	28,168
Farkwa	Mela-Mela-Babayu-Kwamtoro	22,932	68	50	34	779,688	
Total or Average					34	779,688	22,932
Kwamtoro	Mela-Mela-Babayu-Kwamtoro	22,932	68	27	18	412,776	
	Kondoa-Kwamtoro	22,932	56	68	38	871,416	
	Kwamtoro-Kinyamsindo	26,277	48	100	48	1,261,296	
Total or Average					104	2,545,488	24,476
Pahi	Pahi-Bumbuta-Chubi	23,888	37	100	37	883,856	
	Chubi-Arusha Region Boundary	26,277	16	100	16	420,432	
	Bumbuta-Chungai	26,277	12	70	8	210,216	
	Kisaki-Kisese	26,277	16	83	13	341,601	
	Gubali-Mwisanga	26,277	27	65	18	472,986	
	Jangalo-Tandala	29,621	21	25	5	148,105	
	Bicha-Dalai-Tandala-Kolo	26,993	84	57	48	1,295,664	
Total or Average					145	3,772,860	26,020
Goima	Chemba-Goima	23,888	16	100	16	382,208	
	Arna-Chandama-Mrijo Chino	22,932	48	80	38	871,416	
	Chandama-Jangalo	43,954	12	69	8	351,632	
Total or Average					62	1,605,256	25,891
Bereko	Mwanya-Kisese-Kikore	41,087	50	100	50	2,054,350	
	Bumbuta-Chungai	26,277	12	30	4	105,108	
	Kisaki-Kisese	26,277	16	17	3	78,831	
Total or Average					57	2,238,289	39,268
Kolo	Bicha-Dalai-Tandala-Kolo	26,993	84	6	5	134,965	
	Kwaitu-Thawi	24,844	24	100	24	596,256	
	Gubali-Mwisanga	26,277	27	35	9	236,493	
Total or Average					38	967,714	25,466

TABLE A-VI-1

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selected for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road by Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Singida Rural							
Ihanja	Ihanja-Mtongo	23,888	22	60	13	310,544	
	Singida-Ihanja	24,127	29	100	29	699,683	
	Dungunyi-Mungaa	25,799	13	25	3	77,397	
Total or Average					45	1,087,624	24,169
Ikungi	Mangonyi-Ikungi	22,455	24	100	24	538,920	
	Ikungi-Dungunyi	25,799	10	100	10	257,990	
	Dungunyi-Mungaa	25,799	13	33	4	103,196	
	London-Mangonyi	23,171	29	94	27	625,617	
	Ihanja-Mtongo	23,888	22	40	9	214,992	
Total or Average					74	1,740,715	23,523
Mungaa	Mungaa-Makiungu-Kititimo	26,277	14	100	14	367,878	
	Ntuntu-Mungaa	21,738	19	100	19	413,022	
	Mungaa-Misughaa-Kinyamsindo	24,366	39	100	39	950,274	
	Misughaa-Ntuntu	21,738	11	100	11	239,118	
	Dungunyi-Mungaa	25,799	13	42	6	154,794	
Total or Average					89	2,125,086	23,877
Mtinko	Singida-Ilongero-Mtinko	26,277	40	5	2	52,554	
	Mtinko-Mudida	21,021	11	100	11	231,231	
	Singida-Sepuka	22,455	22	100	22	494,010	
	Sepuka-Mahenge	26,277	35	52	18	472,986	
Total or Average					53	1,250,781	23,600
Mgori	Kititimo-Mgori	26,755	11	100	11	294,305	
Total or Average					11	294,305	26,755
Ilongero	Ilongero-Merya-Mlilu	30,338	21	100	21	637,098	
	Singida-Ilongero-Mtinko	26,277	40	95	38	998,526	
Total or Average					59	1,635,624	27,722

TABLE A-VI-1

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selected for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road By Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Iramba							
Kirumi	Nguti-Nkalankala-Mungull	23,888	58	68	39	931,632	
	Iguguno-Kinyangiri-Mkalama	23,888	80	12	10	238,880	
Total or Average					49	1,170,512	23,888
Nduguti	Nguti-Iambi-Nkungi	23,888	35	100	35	836,080	
	Nguti-Nkalankala-Mungull	23,888	58	32	19	453,872	
	Nkalankala-Mwanga-Kidarafa	23,888	28	100	28	668,864	
	Iguguno-Kinyangiri-Mkalama	23,888	80	31	25	597,200	
Total or Average					107	2,556,015	23,888
Kinyangiri	Iguguno-Kinyangiri-Mkalama	23,888	80	57	45	1,0[illegible],960	
	Ulemo-Msingi-Gumanga	20,544	40	52	21	43[illegible],424	
Total or Average					66	1,506,384	22,824
Kinampanda	Ulemo-Msingi-Gumanga	20,544	40	48	19	390,336	
	Sepuka-Songambele-Kisaga	24,605	54	28	15	369,075	
	Kitusha-Kinakumi-Tulya	23,171	68	48	33	764,643	
Total or Average					67	1,524,054	22,747
Kisiriri	Tulya-Doromoni	23,171	6	100	6	139,026	
	New Kiomboi-Kinakumi	18,633	8	100	8	149,064	
	Kitusha-Kinakumi-Tulya	23,171	68	52	35	810,985	
	Misigiri-New Kiomboi	21,021	24	100	24	504,504	
Total or Average					73	1,603,579	21,967
Ndago	Songambele-Urughu-Kibigiri	23,888	56	65	36	859,968	
	Sepuka-Songambele-Kisaga	24,605	54	66	36	885,780	
	Sepuka-Mahenge	26,277	35	48	17	446,709	
Total or Average					89	2,192,457	24,634
Shelui	Songambele-Urughu-Kibigiri	23,888	56	35	20	477,760	
Total or Average					20	477,760	23,888

TABLE A-VI-1

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selcted for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road By Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Manyoni							
Manyoni	Manyoni-Aghondi-Itigi	18,633	40	56	22	409,926	
	Manyoni-Heka	20,783	42	20	8	166,264	
	Manyoni-Mjiri	25,082	16	90	14	351,148	
Total or Average					44	927,338	21,076
Itigi	Itigi-Chaya	22,455	43	100	43	965,565	
	Itigi-Danwalu	23,888	10	100	10	238,880	
	Aghondi-Muhanga-Ipande-Mbugani	23,888	49	100	49	1,170,512	
	Manyoni Aghondi-Itigi	18,633	40	44	18	335,394	
	Manyoni-Mjiri	25,082	16	10	2	50,164	
Total or Average					122	2,760,515	22,627
Manyoni Vijijimi	Manyoni-Heka	20,783	42	54	23	478,009	
	Solyo-Saranda-Hika-Londoni	21,499	72	15	11	236,489	
Total or Average					34	714,498	21,015
Kintinku	Majiri-Chikuyu	23,888	40	50	20	477,760	
	Makasuku-Kilamatinde-Solyo	23,888	27	20	5	119,440	
	Trunk Road-Kintinku-Kitalolo	23,888	8	100	8	191,104	
	Kintinku-Makanda	23,888	32	100	32	764,416	
	Chikuyu-Makutupora	23,888	11	100	11	262,768	
	Chikuyu-Mbwasa	23,888	8	100	8	191,104	
	Solyo-Saranda-Hika-Londoni	21,499	72	81	58	1,246,942	
Total or Average					142	3,253,534	22,912
Nkonko	Nkonko-Ntumbi	23,888	19	100	19	453,872	
	Nkonko-Majiri	23,888	79	100	79	1,887,152	
	Majiri-Kinangali-Makasuku	23,888	12	100	12	286,656	
	Makasuku-Itetma	23,888	11	100	11	262,768	
	Heka-Sastlo	27,710	24	100	24	665,040	
	Hika-Nkonko	21,499	25	100	25	537,475	
	Manyoni-Heka	20,783	42	26	11	228,613	
	Majiri-Chikuyu	23,888	40	50	20	477,760	
	Makasuku-Kilamatinde-Solyo	23,888	27	80	22	525,536	
	Chilillo-Chipanga-Chali-Ikasi	21,499	34	12	4	85,996	
	Solyo-Saranda-Hika-Londoni	21,499	72	4	3	64,497	
Total or Average					230	5,475,365	23,806

TABLE A-VI-1

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selected for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road By Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Same							
Same	Same-Mwembe-Manka-Maindo-Bomba-Mamba	30,577	104	16	17	519,809	
	Meferejini-Same	24,127	26	100	26	627,302	
	Makanya-Kombo-Meferejini	24,127	71	36	26	627,302	
	Kisangara-Upper Kisangara	33,443	15	62	9	300,987	
	Lembeni-Kirya	21,021	20	76	15	315,315	
	Kisangara-Chanjali-Chomvu	33,443	30	26	8	267,544	
	Kisangara-Nyumba Ya Mungu Dam	18,155	17	90	15	272,325	
	Mgagau-Mdea	29,860	15	100	15	447,900	
Total or Average					131	3,378,484	25,790
Mwembe Mbaga	Kisivani-Maindo	34,638	16	100	16	554,208	
	Makanya-Mwembe	23,888	38	32	12	286,656	
	Mkanyeni-Vudee	31,532	8	29	2	63,064	
	Same-Mwembe-Manka-Maindo-Bomba-Mamba	30,577	104	43	45	1,375,965	
Total or Average					75	2,279,893	30,399
Gonja	Same-Mwembe-Manka-Maindo-Bomba-Mamba	30,577	104	28	29	886,733	
	Mpirani-Bomba	32,965	12	100	12	395,580	
	Mpirani-Kadando	29,860	9	100	9	268,740	
	Maore-Makongoanzeghe	29,860	21	32	7	209,020	
Total or Average					57	1,760,073	30,878
Chome/Suji	Makanya-Kombo-Meferejini	24,127	71	64	45	1,085,715	
	Makanya/Mwembe Road-Chome	31,532	19	100	19	599,108	
	Makanya-Mwembe	23,888	38	68	26	621,088	
	Mkanyeni-Vudee	31,532	8	71	6	189,192	
	Hedaru-Vunta	34,638	24	33	8	277,104	
Total or Average					104	2,772,207	26,656
Mamba Vunta	Ndungu-Mamba	32,965	13	85	11	362,615	
	Same-Mwembe-Manka-Maindo-Bomba-Mamba	30,577	104	13	13	397,501	
	Hedaru-Vunta	34,638	24	67	16	554,208	
Total or Average					40	1,314,324	32,858
Ndungu	Ndungu-Mamba	32,965	13	15	2	65,930	
	Maore-Makongoanzeghe	29,860	21	68	14	418,040	
Total or Average					16	483,970	30,248

TABLE A-VI-1

ROAD CONSTRUCTION COSTS BY DIVISION

District and Division	Roads Selected for Rehabilitation	Average Construction Costs per Km. - T/shs.	Total Road Length Kms.	Percentage of Road Length In Division Kms.	Road Length In Division Kms.	Construction Costs: Total All Road By Division T/shs.	Construction Costs: Weighted Average By Division T/shs.
Mwanga							
Ugweno	Mwanga-Kikweni	31,054	11	68	7	217,378	
	Kikweni-Usangi	33,443	14	83	12	401,316	
	Kikweni-Kifula-Mangio-Uchama	32,488	18	100	18	584,784	
	Campi Ya Simba-Uchama	33,443	7	100	7	234,101	
	Kibisini-Mangio	47,776	10	100	10	477,760	
	Butu-Kifula	33,921	7	100	7	237,447	
	Kifaru-Campi Ya Simba Road-Kibisini	23,410	7	45	3	70,230	
	Kifaro-Campi Ya Simba-Butu-Kwakoa-Mgagau	24,127	80	19	15	361,905	
Total or Average					79	2,584,921	32,721
Usangi	Kwakoa-Tolohu	31,054	15	100	15	465,810	
	Mivraini-Usangi	33,443	6	100	6	200,658	
	Kifaru-Campi Ya Simba-Butu-Kwakoa-Mgagau	24,127	80	41	33	796,191	
	Chonvu-Usangi	33,443	15	50	8	267,544	
	Kikweni-Usangi	33,443	14	17	2	66,886	
Total or Average					64	1,797,089	28,080
Mwanga	Kifaru-Campi Ya Simba Road-Kibisini	23,410	7	55	4	93,640	
	Kifaru-Campi Ya Simba-Butu-Kwakoa-Mgagau	24,127	80	35	28	675,556	
	Mwanga-Kagongo	21,021	20	100	20	420,420	
	Mwanga-Kikweni	31,054	11	32	4	124,216	
Total or Average					56	1,313,832	23,461
Lembeni	Kisangara-Upper Kisangara	33,443	15	38	6	200,658	
	Lembeni-Kirya	21,021	20	24	5	105,105	
	Lembeni-Kilomeni	33,443	15	100	15	501,645	
	Kisangara-Chanjali-Chonvu	33,443	30	74	22	735,746	
	Kisangara-Kyamba Ya Mungu Pua	18,155	17	10	2	36,310	
	Kifaru-Campi Ya Simba-Butu-Kwakoa-Mgagau	24,127	80	5	4	96,508	
	Chonvu-Usangi	33,443	15	50	7	234,101	
Total or Average					61	1,910,073	31,313

TABLE A-VII-1

M I N I S T R Y O F W O R K S

Excerpts
from
Draft

R O A D S M A N U A L

ROADS

DAR ES SALAAM

AUGUST 1979

CHAPTER 1

GEOMETRIC DESIGN OF ROADS

1.0 INTRODUCTION

1.01 Geometric design of roads embraces the visual aspects of a road. It is an art based upon the work of many individuals and groups. Design methods and standards are based upon theoretical principles of geometry and physics and includes empirical results from observation and analysis of traffic behavior, human relations, vehicle characteristics and their operations, and the desired traffic handling capacity of the road.

1.02 A good road design must be founded upon basic information concerning the specific project under consideration. Such information should include:

(a) Classification of the highway facility

(b) General indication of the topography and geology of the area to be traversed by the highway facility.

(c) Amount of funds available for the construction and subsequent maintenance.

1.03 The standards to be adopted for the design will be affected and influenced by the following factors:

(a) Road classification

(b) Traffic

(c) Topography and physical features

(d) Safety and economics

(e) Speed

(f) Capacity

(g) Vehicle characteristics

1.1 ROAD CLASSIFICATION

1.1.1 A road network is usually grouped into a number of different classifications for administrative, planning and design purposes. Usually each class is supposed to indicate a set of minimum standards which is in keeping with the importance of the facility.

1.1.2 In Tanzania the existing classification is partly based on administrative aspects of the facility and partly on functional aspects. The existing network is basically classified in accordance with the Government Notice published in the Gazette on 5 May, 1967. The classification takes into account and is in accordance with administrative considerations and functional role of the roads. Technical standards and quality of the roads are not incorporated in the classification system.

1.1.3 The existing classification makes distinction between the following categories of roads:

(a) Trunk roads comprising all inter-territorial and Main internal through routes. These are under the Ministry.

(b) Local Main Roads, comprising all main roads other than Trunk roads.

(c) Regional roads, comprising all other roads which were funded by the Ministry.

(d) District roads, comprising classified roads other than the three categories above. These were funded by the local government.

(e) Unclassified roads — all other roads not covered by the above categories. These were usually funded by special agencies, e.g., Cotton Authority or by local government or villages.

1.1.4 The responsibility of constructing and maintaining all roads other than Trunk Roads is now vested in the RegionalAdministration. Some Regions have reclassified some of their roads and even eliminated some of the above categories.

1.1.5 For design purposes, it is proposed that the roads be divided into six categories, namely:

(a) Trunk Roads

(b) Local Main Roads

(c) Regional Roads

(d) District Roads

(e) Major Feeder Roads

(f) Minor Feeder Roads (farm to market roads)

1.1.6 Minimum design criteria based on the classification under 1.1.5 should be as follows:

Road Class	Carriageway Width (m)	Shoulders (m)	Bridge Loading	Right-of-way width (m)
Trunk	6.5	1.5	HA or HS 20	45
Local Main	6.5	1.5	- do -	45
Regional	6.0	1.5	- do -	30
District	5.5	1.5	H 15	20
Major Feeder	4.5	1.2	H 15	15
Minor Feeder	3.5	1.2	H 15	10

Notes: HA loading refers to BS 153 HA loading
HS20 loading refers to AASHO HS20-44 loading
H 15 loading refers to AASHO H 15-44 loading

1.2 TRAFFIC

1.2.1 The design of a road should be based on the estimated traffic expected to use the facility. A good design should provide flexibility for changing conditions. A period of 10-20 years is usually used as the basis for traffic prediction.

1.2.2 Apart from volume, the number of each of the different types of vehicles should be estimated. Usually the traffic data should at least distinguish between heavy and light vehicles. Light vehicles are those of less than 1500 kg unladen weight.

1.3 SPEED

1.3.1 The design speed is used for the correlation of the geometric characteristics and features of the road. It is dependent upon the type of terrain, the type and volume of traffic and the type of road to be constructed. It is the maximum safe speed that can be maintained over

a specified section of a road when conditions are so favorable that the design features of the road govern.

1.3.2 All elements of a design should be based on the same design speed which should be a good approximation of the actual operation speed.

1.3.3 The recommended minimum design speed for the various carriageway widths are as follows:

Carriageway (m)	Design Speed (km/h)		
	F/R	R/H	M
3.5	60	40	30
4.5	65	50	30
5.5	65	50	40
6.0	65	50	40
6.5	80	65	50
7.0	100	80	60

Notes: F/R - Flat to rolling terrain
R/H - Rolling to hilly terrain
M - Mountainous terrain

1.4 CAPACITY AND OTHER FACTORS

1.4.1 The capacity of a two-lane road is the maximum number of vehicles that can pass over a given section of a road in both directions over a given time period, usually one hour. It is the maximum rate of flow that has a reasonable expectation of occurring. The capacity of a road is dependent upon the level of service the facility is intended to provide. Level of service is a qualitative measure of the effect of traffic flow factors such as speed and travel time, interruptions, freedom of maneuver, driver's comfort and convenience, and, indirectly, safety and operational costs.

1.4.2 Six levels of service are defined. These vary from level A which is the free flow condition where drivers can maintain their desired

speed, i.e., low volume and high speed, to level E where the traffic is approaching saturation with drivers traveling at low speeds due to high volume of traffic. The traffic volume at level of service E is the capacity of the facility.

Level of service F is the forced flow condition where the traffic density is maximum with drivers subjected to frequent stops and queues. Volumes here vary from 0 to capacity, but usually are approaxhing zero.

1.4.3 The maximum number of vehicles which can pass a given section of a road for any given level of service is referred to as maximum service volume. That applicable to level of service E is also the capacity of the facility. Maximum service volume under ideal conditions which a two-lane road can carry, i.e. level terrain, at least 7.3m carriageway, no obstructions within 1.8m from the edge of carriageway and no-passing sight distance restrictions are:

Level of Service A - 400 passenger car units per hour (pcu)
B - 900 pcu
C - 1,400 pcu
D - 1,700 pcu
E - 2,000 pcu
F - 0 to 2,000 pcu

1.4.4 The capacity and maximum service volume of a roadway is affected by a number of factors. These are:

(a) Roadway factors which include —
- (i) carriageway and shoulder width
- (ii) alignment and sight distances (passing)
- (iii) surface condition
- (iv) grades
- (v) intersections
- (vi) obstructions (lateral)

(b) Traffic flow factors such as —
- (i) percentage of heavy vehicles
- (ii) traffic interruptions such as pedestrian crossing and parked vehicles

(iii) speed range found within the traffic stream

(iv) number of overtaking and passing maneuvers required to maintain a desired speed

(c) Environmental factors such as weather.

1.5 GEOMETRIC DESIGN STANDARDS

1.5.1 The geometric design standards for bitumen, gravel/earth and unlaned roads (one-lane, two-way carriageway) are given under paragraphs 1.6, 1.7 and 1.8 respectively. Those for elements not covered under these paragraphs are given below.

1.5.2 Carriageway Width on Bridges

On two-lane bridges, the carriageway width (kerb to kerb) should be at least 1.0m wider than that of the approaches. For all Trunk roads the minimum width should be 7.5m.

On single-lane bridges the minimum width should be 4.0m. Where footpaths are provided, their minimum width should be 1.0m if provided on both sides, and 1.5m if provided only on one side.

1.5.3 Camber

Adequate camber (cross-slope) should be provided on the roadway to facilitate rapid run-off for water falling on the road surface. Recommended values for pavement cross-fall (normal camber) are as follows:

— Asphaltic concrete surfaces - 2.0 to 2.5%
— Surface dressing surfaces - 2.5%
— Stone paved surfaces - 3.0%
— Gravel and earth surfaces - 3.0%

Shoulder slopes should normally be 0 to 3% steeper than that of the carriageway.

1.5.4 Side Slopes

Side slopes should be as flat as economically feasible. Recommended maximum rates of side slopes for embankment (fills) are as follows:

Embankment Height (m)	Side Slope (Vertical: Horizontal)
Less than 1.0m	1:4
1.0 to 3.0m	1:2
Greater than 3.0m	1:1.5

1.5.5 Back Slopes

Recommended maximum rates for back slope are as follows:

Hard Rock	- 1:1 to 4:1
Decomposed rock and compact lateritic soils	- 1:2 to 1:1
Ordinary soils	- 1:2 to 1:15

Benching should be done at 3.0 to 5.0m intervals. The actual maximum rate of slope should be based on local experience.

1.7 DESIGN STANDARDS FOR GRAVEL AND EARTH ROADS

1.7.1 Design Speed

Desirable and minimum design speeds are given in Table 1.7.1 below.

Table 1.7.1: Design Speeds

Carriageway Width (m)	Design Speed km/h						ADT Current ADT (Vpd)
	Desirable			Minimum			
	F/R	R/H	M	F/R	R/H	M	
5.5	80	60	50	65	50	40	30-100
6.0	80	65	50	65	50	40	60-150
6.5	100	80	60	80	65	50	7100

Notes: F/R - Flat to rolling terrain
R/H - Rolling to hilly terrain
M - Mountainous terrain

1.7.2 Roadway Width

Carriageway and corresponding minimum shoulder width should be as follows:

Carriageway Width (m)	5.5	6.0	6.5
Shoulder Width (m)	1.5	1.5	1.5

1.7.3 Roadway Transverse Slope

The carriageway slope along [illegible]ents (normal camber) should be 3%. The shoulder slope should be 3 to 5%.

1.7.4 Minimum Radius of Curves

Desirable and absolute minimum radius of curve for various design speeds are given in Table 1.7.2 below:

Table 1.7.2: Minimum Radius of Curve

Design Speed (km/h)	Side Friction Factor	Minimum Radius (m)		
		Desirable	Absolute	
			e = 0.08	e = 0.06
100	0.13	450	380	420
80	0.14	300	230	250
65	0.15	200	145	160
60	0.15	150	125	135
50	0.16	100	85	90
40	0.17	75	50	55
30	0.17	50	30	30

1.7.5 Superelevation

1.7.5.1 The rate of superelevation to be applied should be calculated using the following formula:

$$e = \frac{V^2}{260\ R}$$

where e = superelevation rate (fraction)
R = radius of curve (m)
V = design speed (km/h)

The values of superelevation to be applied should be rounded off to the nearest 0.001 or 0.1%.

1.7.5.2 The maximum rate of superelevation should be 0.08 (8.0%) and 0.06 (6.0%) for flat to hilly and mountainous terrains respectively. For earth roads, the maximum rate of superelevation should be limited to a maximum of 0.06 (6.0%) irrespective of the terrain classification.

1.7.7 Maximum Grades

Recommended grades are given in Table 1.7.5 below for low volume roads and/or short lengths of grades (less than 150m) the values in the table can be increased by 1%.

Table 1.7.5: Maximum Grades (%)

Terrain	Design Speed						
	30	40	50	60	65	80	100
Flat/Rolling	6	6	5	5	5	4	3
Rolling/Hilly	8	8	7	6	6	5	4
Mountainous	10	10	9	8	8	7	6

1.7.8 Critical Length of Grades

The critical length of grade is the maximum length of the designated upgrade on which a loaded truck can operate without unreasonable reduction in speed. As such the length of all grades should be limited to the values given in Table 1.6.7 for a 24 km/h reduction in speeds of trucks.

Table 1.6.7: Critical Length of Grades

Grade	Critical Length (m)	Maximum Sustained Speed km/h
2.0	850 (1100)	40
2.5	640 (850)	-
3.0	520 (670)	25
3.5	410 (540)	-
4.0	340 (445)	16
4.5	275 (370)	-
5.0	235 (320)	15
5.5	210 (275)	-
6.0	185 (245)	13
6.5	170 (225)	-
7.0	160 (210)	12
7.5 and over	150 (190)	-

The values given in Table 1.6.7 are based on a 24km/h reduction in speed of trucks (from the average running speed). The corresponding values in brackets are for 40 km/h reduction in speed.

The values for 40km/h reduction in speed are given here so that one can get an indication of the effect of grades longer than critical. These values should not be used for design purposes. The critical lengths are also based on tangent lengths. Where a vertical curve is part of a critical length, an approximation must be made as to the equivalent tangent grade length. If the algebraic difference in grade is small, the measurement of critical length of grade may be made between the V.I.P.s. If the algebraic difference is appreciable, one quarter (1/4) of the vertical curve length may be considered as part of the critical grade.

The maximum sustained speed is the top speed trucks can maintain on a given up-grade for lengths greater than critical, i.e. the constant speed the trucks will maintain on an up-grade either decelerating from high speed or accelerating from lower speed. It is assumed that the truck in question has a weight power ratio of 400.

1.7.9 Sight Distances

Minimum stopping and passing sight distances are given in Table 1.6.8 below. The minimum sight distances are for both horizontal and vertical alignments (curves).

Table 1.6.8: Minimum Sight Distances (m)

Design Speed (km/h)	Stopping Sight Distance (m)	Passing Sight Distance (m)
120	210	790
110	185	760
100	160	680
80	115	550
65	85	440
60	75	400
50	55	330
40	40	250

1.7.10 Length of Vertical Curves

Recommended minimum length of vertical curves are given in Table 1.7.9. Where the recommended length is greater than 43.5A, special attention should be given to drainage. Where kerbs are used, it may be necessary to remove them so as to provide adequate transverse drainage.

Table 1.7.9: Recommended minimum lengths of vertical curves

Design Speed km/h	To satisfy stopping sight distances		To satisfy passing sight sistances
	Crest	Sag	
120	103A	55A	660A
110	80A	45A	610A
100	60A	40A	495A
80	32A	25A	325A
65	17A	17A	205A
60	14A	16A	170A
50	10A	12A	115A
40	6A	8A	70A

Note: A = algebraic difference in grade in percent (%), i.e. for A = 10%, A in the table should be 10.

1.7.12 Sight distance on horizontal curves.

The sight line for this purpose is a chord and the sight distance is measured along the centerline of the inside lane around the curve. The minimum distance from the centerline of inside lane to an obstruction (lateral) is given in Table below. The distance given satisfies stopping sight distance requirements.

Table 1.7.12: Minimum distance from the centerline of inside lane to an obstruction

Radius (m)	Distance (metres) for various design speeds (km/h)								
	30	40	50	60	65	80	100	110	120
40		4.9							
50		3.9							
60		3.3	6.2						
70		2.8	5.3						
80			4.7						
100			3.8	7.0					
110			3.4	6.3	8.1				
130			2.9	5.4	6.9				
150				4.7	6.0				
200				3.5	4.5	8.2			
250					3.6	6.6			
300					3.6	5.5	10.6		
350						4.7	9.1		
400						4.1	8.0	10.6	
450							7.1	9.5	
500							6.4	8.5	11.0
600							5.3	7.1	9.2
700							4.6	6.1	7.9
800							4.0	5.3	6.9
1000								4.3	5.5
1200								3.6	4.6
1500									3.7

1.8 DESIGN STANDARDS FOR UN-LANED GRAVEL AND EARTH ROADS (ONE-LANE, TWO-WAY CARRIAGEWAY)

1.8.1 Design Speed

Desirable and minimum design speeds are given in Table 1.8.1 below

Table 1.8.1: Design Speeds

Current ADT (v.p.d.)	Carriageway Width (m)	Design Speed (km/h)					
		Desirable			Minimum		
		F/R	R/H	M	F/R	R/H	M
Less than 20	3.5	65	50	30	60	40	30
20 - 60	4.5	80	60	40	65	50	30

Notes: F/R - Flat to rolling terrain
R/H - Rolling to hilly terrain
M - Mountainous terrain

1.8.2 Roadway width

Recommended carriageway width and the corresponding minimum shoulder widths are given below:

Carriageway Width (m):	3.5	4.5
Shoulder Width (m):	1.2	1.2

1.8.3 Roadway Slopes

The normal crossfall of the carriageway (normal camber) should be 0.03 or 3.0% and that of shoulders should be 3-4%.

1.8.4 Minimum Radius of Curve

See paragraph 1.7.4.

1.8.5 Superelevation

See paragraph 1.7.5.

Table 1.8.2: Length needed to change from normal camber to a superelevation rate of 0.03.

Design Speed (km/h)	Carriageway Width (m)		Maximum Rate of change of Superelevation (%)
	3.5	4.5	
80	21	27	0.50
65	18	24	0.57
60	18	24	0.60
50	15	21	0.66
40	15	18	0.72
30	12	18	0.78

1.8.6 Transition Curve Lengths.

-See paragraph 1.7.6

1.8.7 Maximum Grades

-See paragraph 1.7.7

1.8.8 Critical Length of Grades

See paragraph 1.6.8

1.8.9 Sight Distance

Minimum stopping sight distances are given in Table 1.8.3 below Passing sight distance are not applicable in this case as one of the vehicles has to stop and pull-off the road for the passing and/or overtaking manoeuver.

Table 1.8.3

Design	Assumed Speed (km/h)	Coef. of Friction	Minimum Stopping Sight Distance (m)
80	70	0.31	240
65	58	0.33	180
60	54	0.34	160
50	46	0.36	125
40	38	0.38	95
30	29	0.40	65

1.8.10 Length of Vertical Curves

Recommended minimum lengths of vertical curves are given in Table 1.8.4 below. Where the recommended length is greater than L = 43.5A, special attention must be given to drainage.

Table 1.8.4: Length of Vertical Curves

Design Speed (km/h)	Minimum Length of Vertical Curves (m)
80	50A
65	30A
60	23A
50	14A
40	8A
30	4A

Note: A = algebraic differences in grades (%)

1.8.11 Widening at Curves

Not required.

1.8.12 Carriageway Width at Structures

The recommended carriageway width of single lane bridges is given in panel 1.5.1.

1.8.13 Sight Distances on Horizontal Curves

The required lateral distances from the centerline of the road to an obstruction are given in Table 1.8.5 below.

The required distances are often too large for the right-of-way usually made available for such roads. The absolute minimum obstruction-free area to be used should then be given in Table 1.6.11 if those given in Table 1.8.5 cannot be effected at a reasonable cost. Proper traffic signing is necessary at all such curves.

Table 1.8.5 Minimum lateral distance from the centerline of the road to an obstruction

Curve radius (m)	Distances (m) for various design speeds (km/h)					
	30	40	50	60	65	80
30	16.0	-	-	-	-	-
40	12.5	-	-	-	-	-
50	10.2	21.0	-	-	-	-
60	8.6	17.8	-	-	-	-
80	6.5	13.7	23.2	-	-	-
100	5.2	11.1	18.9	30.3	-	-
150	3.4	7.5	12.8	20.8	26.2	-
200	2.6	5.6	9.7	15.8	19.9	34.9
300	-	3.8	6.5	10.6	13.4	23.7
400	-	2.8	4.9	8.0	10.1	17.9
500	-	-	3.9	6.4	8.1	14.3

TABLE A-VII-2
ROAD INVENTORY
OF ROADS INSPECTED BY STUDY TEAM

Present Classification/ Limits of Inventory	Measured Length in Km	Roadbed Condition: Terrain: F/R	Terrain: P/H	Terrain: H/M	Width in Meters	Surface Material: Gravel	Surface Material: Sand	Surface Material: Earth	Rating as Subgrade: Good	Rating as Subgrade: Poor	Pipe Culverts (Each) Existing: Good	Existing: Repair/ Replace	Existing: New	Bridges and Drifts
A. DODOMA REGION														
1. Mpwapwa District														
Local Main Roads														
Nghambi-Mpwapwa-Mlali	80	✓			4-6			✓		✓	16	6	60	need drift
Mpwapwa-Gulwe	18	✓			4-6		✓			✓	1	3	15	3 drifts
Total Local Main Roads	98 km													
District Roads														
Mlali-Pandambili	24	✓			3			✓	91cm	15km			24	none
Gulwe-Kibakwe	35	✓			3-4			✓		✓	5	3	27	need 2 bridges; need 2 drifts
Kitemo-Mima-Fufu	20	✓			3-4			✓		✓	6	6	22	2 single span; 1 two span; need 5 drifts
Total District Roads	89 km		✓											
Feeder Roads	None													
2. Dodoma District														
Local Main Roads	None													
District Roads														
Dodoma-Mvumi-Nkulabi	41		✓		3-5			✓		✓	26	24	19	1 single span; 1 two span; 2 drifts, need repair
Chololo-Handali	15	✓			3-4			✓		✓	40	4	2	8 single span, 2 need repair; 1 three span; 1 drift, needs repair
Handali-Kitemo	32	✓			2-4			✓		✓	4	2	35	1 single span, needs repair; 7 drifts, 6 need repair; 4 drifts needed
Mkonze-Chidilo-Nondwa	48	✓			3-4			✓		✓	2	7	24	5 single span, 2 need repair; 1 two span, needs repair
Mpunguzi-Mwitikira	18	✓			3-4			✓		✓	8	6	12	1 single span
Trunk Road-Homobolo-Gawaye	42		✓		3-4			✓		✓	11	14	17	2 single span

TABLE A-VII-2 CONTINUED
ROAD INVENTORY
OF ROADS INSPECTED BY STUDY TEAM

Present Classification/ Limits of Inventory	Measured Length in KM	Roadbed Condition: Terrain: F/R	Terrain: R/H	Terrain: H/M	Width in M	Surface Material: Gravel	Surface Material: Sand	Surface Material: Earth	Rating as Subgrade: Good	Rating as Subgrade: Poor	Pipe Culverts (Each) Existing: Good	Existing: Repair/Replace	Existing: New	Bridges and Drifts
2. Dodoma District Continued														
District Roads Continued														
Trunk Road-Msanga-Chilonwa Dabalo-Itiso	85	20km	65km		3-4			✓		✓	43	21	30	1 single span; 2 multi-span, 1 needs repair; 2 two span; 3 drifts, need repair
Chenene-Itiso	25	✓			3-4			✓		✓	1		25	none
Chidilo-Chipanga	16	✓			3			✓		✓	8		8	4 two span; 1 three span
Total District Roads	322 km													
Feeder Roads														
Ntyuka-Chololo	27	✓			3-4			✓		✓		2	34	2 drifts, 1 needed
Makatapora-Chihanga-Gawaye	20	✓			2-3			✓		✓	6		15	3 single span
Hombolo Dan-Mkoyo-Kawawa	14	✓			3			✓		✓	3		11	1 drift needed
Mundemu-Mzakwe	6	✓			4			✓		✓			6	none
Chigongwe-K'gwe	9	✓			3-4			✓		✓	4	8	8	none
Ngulugano-Chipanga	19	✓			2-3			✓		✓			19	none
Kigwe-Mpinga-Ngulugano	17	✓			2-3			✓		✓	3		14	1 single span; 1 two span, needs repair; 3 drifts, 1 needs repair
Mlowa Barbarani-Mwitikira	32	✓			3			✓		✓			32	none
Total Feeder Roads	144 km													
3. Kondoa District														
Local Main Roads														
Mela Mela-Babayu-Kwamtoro	85	✓			3-4	20km	20km	45km		✓ 1km rocky		20	65	2 single span, 1 needed; 1 three span; 4 drifts, 4 needed
Bicha Araa (Dalai)	17		✓		3-5	✓		5km	✓		10	5	8	2 two spans; 6 drifts
Tandala-Kolo	61	✓			3			✓		✓ 9km	2	9	50	multispan needed; 9 drifts needed
Bicha-Kondoa	3	✓			7	✓			✓			2		3 bridges
Total Local Main Roads	166 km													

TABLE A-VII-2 CONTINUED
ROAD INVENTORY
OF ROADS INSPECTED BY STUDY TEAM

Present Classification/ Limits of Inventory	Measured Length in KM	Roadbed Condition: Terrain: F/R	Terrain: R/H	Terrain: H/M	Width in M	Surface Material: Gravel	Surface Material: Sand	Surface Material: Earth	Rating as Subgrade: Good	Rating as Subgrade: Poor	Pipe Culverts (Each) Existing: Good	Existing: Repair/ Replace	Existing: New	Bridges and Drifts
3. Kondoa District Continued														
District Roads														
Araa-Chandama	34	✓			3-5			✓		✓	2	10	22	1 single span; 1 six span
Jangalo-Tandala	22	✓			3-4			✓		✓	5	5	12	1 single span, 1 needed; 1 two span needed, 1 drift needed
Mnenya-Kisese	35	✓			3			✓		✓	4	2	49	4 single span; 3 need repair; 1 multispan needed; 2 drifts needed
Kondoa-Kwamtoro	60	✓			3-4		✓ 20km	✓		✓	3	24	33	1 single span; 1 three span, needs repair; 1 drift
Kwadimu-Thawi	16		✓					✓			1		16	3 single span; 1 three span, needs repair; 1 drift
Total District Roads	167 km													
Feeder Roads														
Chandama-Jangalo	12	✓			3		✓			✓	1		10	need 2 bridges
Kisese-Bereko	12			✓			✓ rocky			✓			12	
Total Feeder Roads	24 km													

TABLE A-VII-2 CONTINUED
ROAD INVENTORY
OF ROADS INSPECTED BY STUDY TEAM

Present Classification/ Limits of Inventory	Measured Length in Km	Roadbed Condition: Terrain: Flat	Terrain: Rolling	Terrain: Hilly	Width in m	Surface Material: Gravel	Surface Material: Sand	Surface Material: Earth	Rating as Subgrade: Good	Rating as Subgrade: Poor	Pipe Culverts (Each) Existing: Good	Existing: Repair/ Replace	Existing: New	Bridges and Drifts
B. SINGIDA REGION														
1. Singida District														
Local Main Roads	None													
District Roads														
Singida-Ilongero-Mtinko	37	✓			3.5-4			✓		✓ 8km	5	2	30	1 single span, needs repair; 3 drifts, 1 needs repair
Ilongero-Merya-Mdilu	21	✓			3, Track			✓		✓		3	18	need single span
Singida-Sepuka	22	✓	✓		3-4			✓		✓	3		19	none
Mangonyi-Ikungi	24	✓			3-4			✓		✓	5		17	1 drift, needs repair, 1 needed
Dungunyi-Mungaa	13	✓			2-3, Track			✓		✓		1	14	1 single span needed; 1 drift
Mungaa-Makiungu-Kititimo	14	✓	✓		4			✓		✓		4	10	1 single span
Kititimo-Mgori	12				3-4	✓			✓	1km	4		8	1 single span needed
Ntuntu-Mungaa	19	✓			4		✓			✓			19	none
Puma-Ihanja	12	✓			3			✓		✓ 2km		2	10	none
Total District Roads	174 km													
Feeder Roads														
Mtinko-Mudida	15	✓			3-4			✓		✓	6	1	8	none
Singida-Ihanja	29	✓			3, Track			✓		✓			29	2 bridges needed
Londoni-Mangonyi	29		✓		2-3, Track			✓		✓			29	none
Mungaa-Misughaa	18	✓			3, Track			✓		✓		7	16	1 bridge needed
Misughaa-Ntuntu	11	✓			3, Track			✓		✓			11	none
Mtinko-Igugono	27	✓			3, Track			✓		✓			27	1 bridge, needs repair
Mgori-Duamganga	47	✓	10km		2-3, Track			✓		✓			47	1 bridge needed
Mungaa-Puma	17	✓			3			✓		✓			17	1 drift, needs repair
Singida/Sepuka Road-Mwanduejembe	34	✓			3			✓		✓	2	3	29	2 drifts
Total Feeder Roads	227 km													

ROAD INVENTORY
OF ROADS INSPECTED BY STUDY TEAM

Present Classification/ Limits of Inventory	Measured Length in KM	Roadbed Condition: Terrain: F/R	Terrain: R/H	Terrain: R/M	Width in M	Surface Material: Gravel	Surface Material: Sand	Surface Material: Earth	Rating as Subgrade: Good	Rating as Subgrade: Poor	Pipe Culverts (Each) Existing: Good	Existing: Repair/Replace	Existing: New	Bridges and Drifts
2. Iramba District														
Local Main Roads														
Msigiri-New Kiomboi	21		✓		5-6			✓		✓	10	1	10	1 bridge
Total Local Main Roads	21 km													
District Roads														
Igugono-Kinyangiri-Gumanga	61		✓		3-5	some		✓		✓	18	1	42	3 single spans; 1 three span; 6 drifts
Sepuka-Songambele-Kisaga	51		✓		3-4			✓		✓	3	3	45	1 single span; 3 drifts, need repair, 2 needed
New Kiomboi-Kinakumi	8		✓		3, Track			✓		✓	4	-	4	none
Kitusha-Kinakumi-Tulya	66		✓ 17	2km	3-3.5	10km		✓		✓	40	40	10	4 drifts, 3 need repair
Ulemo-Msingi-Gumanga	33		✓		3-4	8km		✓		✓	2	3	26	4 drifts
Total District Roads	219 km													
Feeder Roads														
Msagi-Kibgiri	11	✓			2-3, Track			✓		✓ 1km			15	1 single span needed
Old Kiomboi-Kisimba	7	✓			3, Track			✓		✓			7	major bridge or 600' drift needed
Gumanga-Mkiko	16	✓			3-4			✓		✓	6		12	none
Total Feeder Roads	34 km													
3. Manyoni District														
Local Main Roads	None													
District Roads														
Manyoni-Aghondi-Itigi	44	✓			4-5		✓		✓		1	12	19	none
Manyoni-Heka	45	✓			3-4			✓		✓ 15km	33	5	7	none
Total District Roads	89 km													

TABLE A VII-2 CONTINUED

ROAD INVENTORY

OF ROADS INSPECTED BY STUDY TEAM

Present Classification/ Limits of Inventory	Measured Length in KM	Roadbed Condition									Pipe Culverts (Each)			Bridges and Drifts
		Terrain			Width in M	Surface Material			Rating as Subgrade		Existing			
		F/R	P/H	H/M		Gravel	Sand	Earth	Good	Poor	Good	Repair/ Replace	New	
3. Manyoni District Continued														
Feeder Roads														
Manyoni-Njiri, 1st 5 km from Manyoni	5	✓			3			✓		✓			8	none
Heka-Basilo, 1st 2 km from Heka	2	✓			3, Track			✓		✓			4	1 single span needed
Kilamatinde-Solyo-Saranda-Hika-Londoni	65	✓	10km		3, Track			✓		✓	12	4	50	2 single span, 1 needs repair; 1 two span
Trunk Road-Kintinku-Makanda	32	✓			3-4	some		✓		✓ 3km	4	2	26	new two span, needs further work
Total Feeder Roads	105 km													

TABLE A VII-2 CONTINUED
ROAD INVENTORY
OF ROADS INSPECTED BY STUDY TEAM

Present Classification/ Limits of Inventory	Measured Length in km	Roadbed Condition: Terrain: F/R	Terrain: R/H	Terrain: H/M	Width in m	Surface Material: Gravel	Surface Material: Sand	Surface Material: Earth	Rating as Subgrade: Good	Rating as Subgrade: Poor	Pipe Culverts (Each) Existing: Good	Existing: Repair/ Replace	Existing: New	Bridges and Drifts
C. KILIMANJARO REGION														
1. Same District														
Local Main Roads														
Makanya-Mwembe	37	✓		✓	4-5			✓		✓		15	25	2 bridges needed
Mkanyeni-Vudee	10				3			rocky		✓	2		26	none needed
Same-Mwembe	13	✓		✓	3-4	✓			✓	✓	5		6	1 single span; 1 drift, needs repair
Msindo-Bomba	22				3			rocky		✓	6		40	2 single span
Total Local Main Roads	82 km													
District Roads														
Makanya-Kombo-Mefereji ni	49	✓			3		✓			✓	8		34	1 drift
Mefereji ni-Same	37	✓		✓	3-4		✓	✓		✓		8	18	1 drift
Kistwani-Msindo	11				3					✓	19	8	12	2 single span, 1 needs repair, 2 needed; 1 drift needed
Mpirani-Bomba	10			✓	3			rocky		✓	7	9	34	1 single span
Msindo/Bomba Road-Maore	16			✓	3			rocky		✓	10		52	5 drifts, 9 needed
Total District Roads	123 km													
Feeder Roads	None													
2. Mwanga District														
Local Main Roads														
Mwanga-Kikweni	12			✓	3-4			✓		✓	43	10	10	2 single span; 2 drifts needed
Kikweni-Usangi	10			✓	3-4			✓		✓	9	16	6	1 single span; 4 drifts needed
Kikweni-Kifula-Mangio-Uchama	18			✓	3-4			✓		✓	7	14	15	1 single span; 6 drifts needed
Kisangara-Nyumba Ya Mungu Dam	17	✓			6	✓			✓		5		5	none needed

ROAD INVENTORY
OF ROADS INSPECTED BY STUDY TEAM

Present Classification/ Limits of Inventory	Measured Length in Km	Roadbed Condition: Terrain: Flat	Terrain: Rolling	Terrain: Hilly	Width in m	Surface Material: Gravel	Surface Material: Sand	Surface Material: Earth	Rating as Subgrade: Good	Rating as Subgrade: Poor	Pipe Culverts (Each) Existing: Good	Existing: Repair/ Replace	Existing: New	Bridges and Drifts
2. Mwanga District Continued														
Local Main Roads Continued														
Muvraimi-Usangi, 1st 3 km from Usangi (to Lomwe)	3			✓	3			rocky		✓		4	4	1 single span
Mwanga-Kagongo	20	✓			4-5		✓		✓		7	11	12	2 single span, need repair
Total Local Main Roads	80 km													
District Roads														
Lembeni-Kirya	20	✓			3-4		✓		✓				20	1 drift needed
Kifula-Butu, 1st 4 km from Kifula	4			✓	2-3			rocky		✓	7		5	1 drift, 2 needed
Total District Roads	24 km													
Feeder Roads														
Kitaru-Campi Ya Simba-Butu-Kwakoa-Mgagau,, 1st 21 km from Kitaru	21	✓			3-4		✓		✓		2		20	3 drifts needed
Kwakoa-Toloha	15		✓		3		✓			✓			10	4 drifts needed
Kitaru/Campi Ya Simba Road-Kibisini	7	✓			3		✓		✓				10	1 drift needed
Kagongo-Kisangara/Nyumba Ya Mungu Dam Road	17		✓		2.5-3	✓			✓				11	3 drifts needed
Total Feeder Roads	60 km													

TABLE A-VII-3. LIST OF EXISTING AND NEW REQUIRED STRUCTURES ON ROADS INVENTORIED BY STUDY TEAM

PRESENT CLASSIFICATION/ LIMITS OF INVENTORY	MEASURED LENGTH(km)	DRIFTS			SINGLE SPAN			TWO-SPAN			MULTIPLE-SPAN			REMARKS
		GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	
DODOMA REGION														
Mpwapwa District Local Main Roads														
Mpwapwa-Mlali	43	-	2	-	2	1	-	1	-	-	-	-	-	
Mpwpwa-Gulwe	15	3	-	-	1	1	-	2	-	-	-	-	-	
District Roads														
Gulwe-Kibakwe	35	-	-	3	3	1	-	-	-	-	-	-	-	
Kitemo-Mima-Futu	30	1	1	5	1	1	-	1	-	-	-	-	-	
Dodoma District District Roads														
Dodoma-Mvumi-Nkulabi	41	-	2	-	2	-	-	1	-	-	-	-	-	
Chololo-Handali	15	-	1	-	7	2	-	-	-	-	1	-	-	
Handali-Kitemo	32	1	5	7	-	1	-	-	-	-	-	-	-	
Mkonze-Chidilo-Nondwa	48	1	1	1	1	2	1	2	-	-	-	-	-	
Mpunguzi-Mwitikira	18	-	-	-	-	-	-	-	-	-	1	-	-	
Trunk Rd-Hombolo-Gawaye	42	-	-	-	1	-	-	-	-	-	-	-	-	

TABLE A-VII-3 (Continued)

PRESENT CLASSIFICATION/ LIMITS OF INVENTORY	MEASURED LENGTH (km)	DRIFTS			SINGLE SPAN			TWO-SPAN			MULTIPLE-SPAN			REMARKS
		GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	
Trunk Rd-Msanga-Chilonwa-Dabalo-Itiso	85	1	2	-	5	-	-	2	-	-	1	1	-	
Chenene-Itiso	25	-	-	-	-	-	-	-	-	-	-	-	-	
Chidile Chipanqa	16	-	-	-		-	-	4	-	-	1	-	-	
Feeder Roads														
Ntyuka/Chololo	27	5	-	4	-	-	-	-	-	-	-	-	-	
Makatopora-Chihanga-Gawaye	20	-	-	-	1	-	-	1	-	-	-	1	-	
Hombolo Dam-Mkoyo-Kawawa	14	-	-	1	3	-	-	-	-	-	-	-	-	
Kigwe-Mpinga-Ngulugano	17	2	1	1	-	1	-	-	1	1	-	-	-	
Kondoa District Local Main Roads														
Mefamela-Babayu-Kwamtoro	85	4	-	4	20	-	-	-	-	1	1	-	-	
Bicha-Dalai-Tandala Kolo	78	3	-	10	1	-	-	1	-	1	-	-	1	

TABLE A-VII-3 (Continued)

PRESENT CLASSIFICATION/ LIMITS OF INVENTORY	MEASURED LENGTH(km.)	DRIFTS			SINGLE SPAN			TWO-SPAN			MULTIPLE-SPAN			REMARKS
		GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	
District Roads														
Araa-Chandama	34	-	-	-	1	-	-	-	-	-	1	-	-	
Jangalo-Tandala	22	-	-	1	-	-	1	-	-	1	-	-	-	
Mnenya-Kisese	35	-	1	1	-	2	2	-	2	-	-	-	2	
Konodoa/Kwamtoro	60	1	-	-	1	-	-	-	-	-	-	1	-	
Kwadinu-Thawi	16	4	-	-	3	-	-	-	-	-	-	-	1	3-Span 68m Bridge under construction
Feeder Roads														
Chandama-Jangalo	12	-	-	-	-	-	1	-	-	-	-	-	1	
TOTALS	865	27	20	46	54	13	5	10	3	4	7	3	4	

TABLE A-VII-3 (Continued)

PRESENT CLASSIFICATION/ LIMITS OF INVENTORY	MEASURED LENGTH(km)	DRIFTS			SINGLE SPAN			TWO-SPAN			MULTIPLE-SPAN			REMARKS
		GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	
SINGIDA REGION														
Singida District														
District Roads														
Singida-Ilongero-Mtinko	37	2	1	-	1	1	-	-	1	-	-	-	-	
Ilongero-Merya-Mdilu	21	-	1	1	1	1	1	-	-	-	1	-	-	
Singida-Sepuka	22	2	-	1	-	-	-	-	-	-	-	-	-	
Mangonyi-Ikungi	24	1	-	1	-	-	-	-	-	-	-	-	-	
Dungunyi-Mungaa	13	-	-	-	-	-	1	-	-	-	-	-	-	
Mungaa-Makiungu-Kititimo	14	-	1	1	1	-	-	-	-	-	-	-	-	
Kititimo-Mgori	12	-	-	-	-	-	1	-	-	-	-	-	-	
Ntentu-Mungaa	19	-	-	1	-	-	-	-	-	-	-	-	-	
Feeder Roads														
Singida-Ihanja	29	-	-	-	-	-	-	-	-	2	-	-	-	
Mungaa-Misughaa	18	-	-	1	-	-	1	-	-	-	1	-	-	
Mgori-Duamganga	47	-	-	-	-	-	1	-	-	-	-	-	-	

TABLE A-VII-3 (Continued)

PRESENT CLASSIFICATION/ LIMITS OF INVENTORY	MEASURED LENGTH(km)	DRIFTS			SINGLE SPAN			TWO-SPAN			MULTIPLE-SPAN			REMARKS
		GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	
Iramba District														
District Roads														
Igugumo-Kinyangiri-Gumanga	61	7	1	-	1	-	-	1	1	-	1	-	-	
Sepuka-Songambele-Kisaga	51	-	2	3	-	1	-	-	-	-	-	-	-	
Kitusha-Kinakumi-Tulya	66	4	-	-	-	-	-	-	-	-	-	-	1	
Ulemo-Msingi-Gumanga	33	2	2	-	-	-	-	-	-	-	-	-	-	
Feeder Roads														
Msagi-Kibigiri	11	-	-	-	-	-	1	-	-	-	-	-	4	Relocate road to west
Old Kiombo-Kisimba	7	-	-	1	-	-	-	-	-	-	-	-	-	
Gumanga-Mkiko	16	5	-	-	-	-	-	-	-	-	-	-	-	
Manyoni District														
Feeder Roads														
Kilamatinde-Solya-Sitanda-Ilika-Londoni	66	-	-	-	1	-	-	3	-	1	-	-	-	
Trunk Road-Kintinku-Makanda	32	-	-	-	-	-	-	-	1	-	-	-	-	
TOTALS	599	23	8	9	4	2	6	4	3	3	3	-	5	

TABLE A-VII-3 (Continued)

PRESENT CLASSIFICATION / LIMITS OF INVENTORY	MEASURED LENGTH(km)	DRIFTS			SINGLE SPAN			TWO-SPAN			MULTIPLE-SPAN			REMARKS
		GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	
KILIMANJARO REGION														
Same District Local Main Roads														
Makanya-Mwembe	37	-	-	-	-	-	2	-	-	-	-	-	-	
Same-Mwembe	13	-	1	-	-	-	1	-	-	-	-	-	-	
Msindo-Bomba	17	-	-	-	2	-	-	-	-	-	-	-	-	
District Roads														
Mkanya/Mwembe Road-Chome	19	2	-	-	1	-	-	-	-	-	1	-	-	
Makanya-Kombo-Meferejeni	49	1	-	-	-	-	-	-	-	-	-	-	-	
Mferejeni-Same	37	1	-	-	-	-	-	-	-	-	-	-	-	
Kisiwani-Msindo	11	-	-	1	1	1	2	-	-	-	-	-	-	
Mpirani-Bomba	10	-	-	-	1	-	-	-	-	-	-	-	-	
Msinda/Bomba Road-Mtore	16	5	-	9	-	-	-	-	-	-	-	-	-	
Mwanga District* Local Main Roads														
Mwanga-Kikweni	12	-	-	2	2	-	-	-	-	-	-	-	-	

*Requirements in Mwanga District include those submitted by District Engineer in a road by road inventory.

TABLE A-VII-3 (Continued)

PRESENT CLASSIFICATION/ LIMITS OF INVENTORY	MEASURED LENGTH (km)	DRIFTS			SINGLE SPAN			TWO-SPAN			MULTIPLE-SPAN			REMARKS
		GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	GOOD	REPAIR	NEW	
Kikweni-Usangi-Mavrafini	20	-	-	4	2	-	-	-	-	-	-	-	-	
Kikweni-Kifula-Mangio-Uchama-Campi Ya Simba	25	-	-	6	1	-	-	-	-	-	-	-	-	
Mwanga-Kagengo	20	-	-	-	-	2	-	-	-	-	-	-	-	
Lembeni-Kirga	20	-	-	1	-	-	-	-	-	-	-	-	-	
Butu-Kifula	7	1	-	2	-	-	-	-	-	-	-	-	-	
Kwakoa-Taloha	15	-	-	4	-	-	-	-	-	-	-	-	-	
Kagongo-Kisanyara/ Nyumba Ya Mungy Dam Road	17	-	-	3	-	-	-	-	-	-	-	-	-	
Kisangara-Upper Kisangara	15	-	3	2	-	-	-	1	-	-	-	-	-	
Kisangara-Chanjaii	15	-	3	2	-	-	-	-	-	-	-	-	-	
Lembeni-Kilomeni	15	-	2	4	-	-	-	-	-	-	-	-	-	
Feeder Roads														
Kifaru-Campi Ya Simba-Butu-Kwakoa-Mgagau	80	-	6	10	-	-	-	-	-	1	-	-	1	
Kifaru/Campi Ya Simba Rd.-Kibisini	7	-	-	2	-	-	-	-	-	-	-	-	-	
TOTALS	391	10	15	41	10	3	5	1	-	1	1	-	1	