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COOPERATIVE AGREEMENT ON HUMAN SETTLEMENTS AND NATURAL RESOURCE SYSTEMS ANALYSIS

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LOCAL RESOURCE MANAGEMENT IN KENYA: AN ISSUES PAPER

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EXECUTIVE SUMMARY

Local resource management is the voluntary management by local communities of forest, water, soil, and grazing resources. It is at the core of many of Kenya's rural development programs, particularly those in the arid and semi-arid areas (ASAL). In many of these areas, improved production is contingent on a sustained natural resource base. Previous attempts at improving this base--for example the African Land Development Program (ALDEV) of the 1950s--failed because local people and their management systems were not incorporated. Such local participation is critical: from the government perspective, it is required in order to reduce high recurrent costs; from the community viewpoint, it is needed to ensure compatibility with existing management systems.

There is considerable variability among the different local resource management systems in Kenya. The relationship of the resource (water, range, soil, or forest) to increased production, land value, or the "scarcity" factor (defined in Section 3.3) often determines the care with which individual and communal management of the resource is practiced. Availability of labor for local resource management--which must compete with labor's use in farm and non-farm income-producing activities--is another critical factor. In general, on-farm resource management is prevalent in the well-watered

highland areas, and off-farm or communal resource management is dominant in the lower rainfall range areas.

It was found that lack of maintenance is the most critical impediment to government-sponsored local resource management programs. Thus, the costs of maintenance and operation should be a major factor in determining the scale of technology to be introduced in resource-related (e.g., water) projects. In terms of water point development, shallow wells were found to have the lowest annual operating and maintenance costs, while pump-driven water sources have the highest annual operating and maintenance costs. The level of technology and investment often determines the degree to which local communities are able to participate in management and maintenance decisions. Small-scale investments usually are more effective for building on local resource management practices than are large, capital-intensive programs. If local communities are expected to participate in management and maintenance costs, then the issue of what is appropriate within the communities' limitations becomes decisive.

Kenya possesses several examples of good local resource management, where both conservation and production have been enhanced. These include: small-scale irrigation in Taita, Elgeyo-Marakwet, and Baringo Districts; dry-season water-point management in Kitui District; reforestation in Kirinyaga and Kakamega Districts; and soil conservation in Machakos District. Many of these would require very minimal investments to achieve higher returns.

The District should serve as the planning, advisory, and coordinating unit for resource management programs, but the unit for management and local participation should more closely approximate the sub-location. It is at this latter level that communities and individuals make management decisions--for example, the allocation of reserved areas for grazing or the management of a water point. The District Development Committees should work with chiefs and sub-chiefs to identify local resource management practices that can be utilized in water, forestry, and other resource-related programs. While some data are available, the extent to which local resource management is practiced in rural Kenya is still not fully understood. In implementing local resource management programs, the District government should acknowledge that non-governmental organizations (NGOs) often are more effective at the local level than is government.

In the ASAL areas, much of the resource mismanagement and many land-use conflicts were found near irrigation/settlement schemes, newly opened tarmac roads, or "gateway" towns. A clear land-use policy, defining user rights, is required for these transitional areas before resource management can be improved. Uncertainty about land and resource rights allows outsiders to exploit local resources in such areas.

Local resource management is not a new "field" requiring new programs and different types of investment. It is an arena of activity that most rural Kenyans participate in, in one form or another, and one which many existing projects--such as the Machakos Integrated Development Project and the Baringo Pilot Semi-Arid Area Project--have been able to tap for soil, water, and forest conservation purposes. In some respects, it has parallels with the "harambee" movement, although the latter is not strictly concerned with the management of natural resources. Efforts should be made toward increasing government awareness,particularly at the District level,of local systems and practices for managing resources and of the importance of incorporating these in current agricultural production and conservation programs.

C O N T E N T S

		Page
Executive Summary		
Preface		vii
1.	Introduction	1
1.1	The Rationale for Local Resource Management	1
1.2	Defining Local Resource Management	6
1.3	A Note on Methodology and Data	8
2.	The Variability of Local Resource Management Systems in Kenya	9
2.1	Toward a Conceptual Framework	9
2.2	Highland Production Systems	12
2.3	Midland Mixed Farming Areas	17
2.4	The Range Areas	27
3.	Examples of Local Management and Participation	34
3.1	Small-Scale Irrigation	35
3.2	Reserved Grazing in Kajiado District	39
3.3	The Scarcity Factor and Its Relationship to Water Management	43
4.	Local Resource Management in the Context of "Gateway" Town Development	46
4.1	The Regional Benefits of Town Growth	47
4.2	The Environmental Costs of Population Concentration	49
4.3	The Need for Plannning and a Better Understanding of Rural-Town Linkages	50
5.	Identifying the Appropriate Level for Management and Participation	52
5.1	Planning versus Implementation and Management	53
5.2	Recognizing Informal Organizations and Strategies	56

6. Policy and Planning Issues 59

6.1 Giving More Attention to Maintenance Costs in the Planning of Resource-Based Projects 59
6.2 Promotion of Small-Scale Projects 63
6.3 "Gateway" Towns and the Need for a Land-Use Policy 65
6.4 Moving Responsibility Closer to Producers 65

FOOTNOTES 67

APPENDIX I Sites Visited 69

APPENDIX II Individuals Contacted 70

APPENDIX III Machakos Water Form 72

BIBLIOGRAPHY 73

PREFACE

This paper responds to a request from the Ministry of Finance and Planning for a position paper on major local resource management (LRM) systems in Kenya, including possible ways of improving them. The Terms of Reference for the study called for both a literature review (two weeks) and field visits (three weeks) in selected Districts. It was indicated in the initial request that:

> The LRM systems to be investigated and reviewed should center around rural people or communities voluntarily practicing soil and water conservation activities, afforestation works, grazing control (particularly around water points, cropland and within water catchments), and last but not least, the better supply of water to crops, livestock, and rural families. The present impetus for improved LRM comes from the Arid and Semi-Arid Lands Programs, but the aim of the position paper is to discuss major LRM systems countrywide. More specifically, the interest is to have off-farm LRM systems described.

The literature review and field visits and final position paper should give special attention to possible areas of conflict and support between persisting traditional systems of LRM and the newer ones induced by Government, NGOs, and others.

While the following paper addresses the points raised in the original terms of reference, it was revealed through field investigations that, for example, the emphasis on off-farm resource management was inappropriate for certain geographical areas (e.g., Western Kenya) and for certain conservation activities (e.g., soil conservation). Moreover, it is shown that in terms of local resource management, particularly of the core resources of water, soil and grazing, the critical ecological zone is the arid and semi-arid land areas (ASAL). Thus, while certain high rainfall areas were investigated during the field research phase, the report is biased toward the ASAL, since they proved more appropriate in terms of the substance and goals of the terms of reference.

Following discussions with the Director of Planning, Ministry of Finance and Planning, Professor Ryan, and Mr. Emery Roe, ASAL Advisor, Ministry of Finance and Planning, modifications and refinements of the proposed study were made. It was agreed that the availability of labor (as well as the capacity to mobilize it) for resource conservation versus production and other income-earning activities, such as rural

non-farm employment and wage migration, would serve as an organizing theme for the investigation. It also was suggested that because in many of the ASAL areas the most dynamic area of resource and land use conflicts surrounds the rapidly growing towns and settlements, the linkages between towns and rural hinterland were to be given attention. This topic derives further support from Kenya's most recent five year development plan that identifies these urban centers (called "gateway towns" in the plan) as priority areas for development investment.

During the course of fieldwork, more than thirty specific sites were visited in Baringo, Elgeyo-Marakwet, Kakamega, Siaya, Kitui and Isiolo Districts (see Appendix I). Several individuals (both Government and non-Government) in these Districts proved particularly helpful (see list in Appendix II), and while they are too numerous to identify here, I nevertheless very much appreciate their support.

The paper is written under the auspices of the resource management research theme of the Clark University/Institute for Development Anthropology Cooperative Agreement on Settlement and Natural Resource Systems Analysis (SARSA). Much of the library-based research had been previously completed in connection with a more general SARSA paper on Local Institutions and Resource Management in Eastern and Southern Africa.

1. Introduction

1.1 The Rationale for Local Resource Management

The impetus for a paper on Local Resource Management in Kenya derives from several sources (see Roe 1984). First, there is a general recognition that many of Kenya's rural development programs, particularly those recently initiated in the ASAL, have a core set of activities that deal essentially with the management on the part of local communities and farmers of basic productive resources. Although particular emphasis on which of these resources is included may vary from program to program, they generally involve the management of water, soil (including forest resources) and grazing, with the implicit goal of improving production while sustaining the physical resource base. This core set of resource activities, in turn, forms the essence of many of Kenya's recent District Development Plans--for example, those for Baringo, Turkana, Kitui, Machakos, Isiolo, Samburu, Embu, Meru, and Elgeyo-Marakwet Districts (among others). In most cases where the physical resource base is particularly meager and vulnerable, it is felt that improved food production is contingent upon enhancement of this resource base.

Second, the recurrent costs or financial considerations make an understanding of local resource management important for government planners, who are forced to make difficult decisions regarding the allocation of increasingly scarce public sector funds. Because of this, it is urgent that the most cost-effective methods of managing such essential resources as water be fully explored.[1] In many cases, this means investigating those local institutions and practices that are already in place and that have proved, in part, to be effective in conserving the physical resource base. What is emerging as the most critical cost factor is the maintenance problem, which has resulted in projects' becoming non-functioning shortly after completion. This has proved to be particularly true for water projects (for both irrigation and livestock production) that involve mechanical pumps, and where maintenance, as well as diesel fuel to operate the devices, must come from outside the community (see Hogg 1983; Ministry of Agriculture and Livestock Development 1984; DEVRES 1979). For example, in certain Districts like Samburu and Kitui, much of the annual budget for water development will go to the rehabilitation and maintenance of existing water points (many of which were completed under the ALDEV effort), rather than to the development of new water sources _per se_. The trend toward increased allocation of funds for maintenance and operation costs, rather than for the development of new water points, is generalizable for many

Districts in Kenya. Several of the small-scale water projects surveyed by me over the past month involved the rehabilitation and maintenance of an existent scheme. Increased participation on the part of local communities in the planning, management, and maintenance of local resource-based activities may mean the difference between having a dependable source of water and not having water at all.

A third rationale for this paper stems from a general consensus that the extent to which local communities are voluntarily practicing local conservation measures is not fully recognized at either the center (Nairobi) or the Districts. In many cases, further field research is not needed, but rather a synthesis of available literature and data. An inherent problem regarding this lack of knowledge is that hastily conceived resource management projects are implemented (often under the time constraint for a donor's five-year project cycle) without regard to existing resource management systems in the area, and without recognizing that the imposed system may, indeed, conflict with the indigenous one. A good example of such a problem involved the development of small-scale irrigation in Loboi Location (particularly the Sandai area),

Baringo District. The indigenous irrigation at Sandai and Loboi are without question the most successful and efficient systems in central Baringo (including the capital-intensive National Irrigation Board Scheme, the Perkerra, at Marigat). In central Baringo, crop yields are highest at Loboi and Sandai, and thus food security is not a problem, although most of the other Locations in the surrounding areas receive food relief in most years (Little 1982). Nevertheless, the Loboi area was selected by the Provincial Irrigation Unit for small-scale irrigation development. Design work, which was initiated in 1979, called for perennial irrigation at fixed areas in Sandai. (It should be noted that the indigenous irrigation was a rotating system whereby areas were left fallow every three years due to inordinate vegetation growth and reduced yields. Water from the main irrigation canal was shared by Il Chamus of Kailer and Tugen from Sandai.) The new scheme not only interfered with the local cultivation/fallow system, which had proved effective, but also led to increased friction between Tugen and Il Chamus because, rather than sharing water for fields in their own areas, both groups were required to cultivate in Sandai Sub-Location. To date (1984), the scheme has not been completed, due both to local water- and land-use conflicts and to general non-cooperation

among farmers. Ironically, during this same period, self-help irrigation schemes have been completed or are near completion at three nearby areas (Salabani, Nolororo and Loiminang). As will be discussed later in the paper, small, incremental improvements (e.g. lining the main canal) to schemes such as Sandai, as well as to similar systems elsewhere in Kenya, often are more appropriate than a major irrigation program.

A final motivating factor for the paper is the reality that in many circumstances misunderstandings exist between government and local communities regarding their respective roles in the construction, operation and maintenance of resource-based projects. The Berger report on water resources in Kitui District summarizes this point well (Louis Berger International 1982:6.E.8):

> "...the general point of view of the local people is 'if we start it, the government will finish it and maintain it'. The general point of view of the national government and donor agencies is, on the other hand, 'if the people participate in the construction, they will

continue to help with the maintenance, thereby reducing recurrent costs to a manageable level for us'. The result of these mutually misunderstood objectives is an over-emphasis on water point construction and inadequate maintenance on all sides".

While this statement is not generalizable to all resource-based activities, it does point to certain problems of communication between government and the local people. I visited a water supply scheme in Kitui District, for example, where the government was convinced that the community was going to finance all maintenance and operation costs, when in fact the community had only grudgingly agreed to provide some harambee labor for construction. The appropriate role of government in small-scale resource-based projects will be addressed later in the paper.

1.2 Defining Local Resource Management

Local resource management as defined for the purposes of this paper entails voluntary management by local communities of forest, water (for either agriculture, livestock or human use, or any combination of these), soil and grazing resources. While the emphasis is on off-farm resource management, in some cases it is necessary to

discuss on-farm management, particularly where it is the predominant form. The emphasis, however, is on groups of producers, not individual farmers or herders, who within their own enterprise may practice several different resource management strategies. For example, pastoral herders independently practice several conservation practices (such as mixing herd species to conserve certain grazing and browse resources). Such nuances, however, are beyond the scope of this paper. In some cases, management of these four resources (forest, water, soil and grazing) often is integrated at the local level, such that it becomes difficult to analyze the management of one of these resources independent of the others. Access to water in a range area, for example, often dictates grazing patterns which, in turn, can affect the composition of soil, forest (particularly browse species) and grasses. Finally, the effective management of these resources may be a conscious objective of the community concerned, or merely the result of a particular production practice which conserves the resource base, but where the latter is not the primary goal. For the purposes of this paper, both of these management types are addressed.

1.3 A Note on Methodology and Data

Because of the brevity of fieldwork (three weeks), I have had to rely, to some extent, on data that I collected during previous research efforts (1974, 1979-81, 1983), mainly in Baringo District and in Western Kenya. Fortunately, Kenya has available some studies and secondary data on the subject; I relied considerably on these sources of information. Prior to visiting each of the six Districts, a "key points guide" was formulated, indicating critical areas of query that would be important for understanding that District's local resource management. The content of these guides varied from area to area, and were based both on my own previous knowledge of the regions and on available data sources.

In terms of data collection, the "key points guide" influenced whom I interviewed in each District. In most cases, they were members of local committees, local producers, local researchers, government officials, personnel of development projects, members of church groups, and local volunteers. "Key informants" and actual site visits were used to supplement or corroborate already available information. This method does not generate a statistically reliable sample of informants, but it proved useful, given the project's

limitations of time. In many cases, I was fortunate to contact doctoral-level researchers in the field who were conducting long-term research on related topics.

The remainder of the paper is devoted to a general description of different Kenyan local resource management systems in relation to production; small town development; the "scarcity" factor; the role of local institutions and organizations; the appropriate level for management and participation; special case studies; government policy; and areas for further investigation.

2. The Variability of Local Resource Management Systems in Kenya

2.1 Toward a Conceptual Framework

The economic and ecological variability of rural Kenya makes general statements about local resource management problematic. This was evident from the fieldwork in Western Kenya, a region which differs from the ASAL areas in several important respects. It was found necessary, therefore, to formulate a framework that would allow some general comparison between the areas surveyed (i.e., Rift Valley, Western, Eastern and Nyanza Provinces). Critical to local resource management is the availability

of labor, as well as the ability to mobilize it. Yet the question of labor cannot be addressed independently of the local production system. Here I use the term production system to include all livelihood activities: that is, not only crops and livestock production, but also non-farm rural employment and rural-urban wage migration. A broader definition of production system to include more than only agricultural activities is especially appropriate in the Kenya context, since on average non-farm sources of income account for more than 50% of rural household earnings (Livingstone 1981).

This initial focus on labor allows us to further distinguish regions according to related variables. These include: people/land ratios; extent of rural-urban migration; statistical importance of female-headed households (usually affected by male migration); the degree of production diversification; the importance of education (and its impact on labor availability); and the intensification of agricultural practices. All these factors have implications for labor use and, in turn, often are related to another set of factors, which are important for differentiating local resource management systems. These latter variables include: type of land tenure system; market value of land resource; value of agricultural commodities produced; net per capita income; and presence of local organizations for mobilizing labor.

To link these labor and land-related variables to local resource management, it becomes necessary to differentiate regions according to the physical resource base. However, in the Kenyan context, the above factors are not totally unrelated to physical resource considerations. That is to say, such factors as high people/land ratios, individualization of land holdings, production of high value crop, production diversification (involving off-farm activities), and high land value are associated with the areas that are better endowed ecologically-- where water (both rainfall and surface), good soils, and perennial grasses are readily available. In terms of government services - for example, education, roads and water supply schemes - these areas also are advantaged.

Below I delineate the different production zones that the field survey covered (Kakamega, Kitui, Baringo, Isiolo, Elgeyo-Marakwet and Siaya Districts), as well as areas that I am familiar with from previous work or from the literature (e.g. Machakos, Turkana, Samburu, Kirinyaga, Kisii and Marsabit). I refer to Kenya's agro-ecological classification system (Ministry of Agriculture 1983) to define production areas. The general implications for local resource management of the different production zones I have used are discussed.

2.2 Highland Production Systems

This covers zones LH(1-3) and UM(1-3) in Kenya's agro-ecological classification system.[2] Several excellent studies of Kenya's highland areas that include data on local resource management already exist. For example, Haugerud (1981; 1983) for highland Embu; O'Keefe (1974) for Kiambu; Castro (1983) for Kirinyaga; Migot-Adholla (1977) and Paterson (1979) for Kakamega; Barnes (1983a; 1983b) for Kisii; and ADEC (1983) for Nyeri. My present fieldwork covered parts of Kakamega District, while previously I had done short-term work in the highland areas of Kisii District.

In general, the highland areas have the following characteristics:

-- altitude over 1600 meters;

-- annual rainfall over 1000 mm;

-- high rural-urban migration rate;

-- small average land holdings (usually less than 2 ha per household);

-- production of high value crops;

-- labor-intensive agricultural systems, especially in coffee- and tea-growing areas;

-- private ownership of land holdings;

-- absence of common lands, other than state-controlled forests;

-- production of fodder grasses and keeping of grade and cross-bred livestock;

-- increasing prevalence of female-headed households;

-- widespread use of hired agricultural labor;

-- prevalence of non-farm income in household economy;

-- localized shortages of fuelwood, which in many areas is monetized;

-- net importer of charcoal products, often from neighboring drier areas; and

-- very high percentage of school-age children attending schools.

In most of these highland areas, virtually all resource management practices, other than for water, are carried out on-farm. Many of the households in these areas do plant trees, predominantly for building materials, fuelwood, or boundary markers, and in some cases, farmers will have small nurseries where seedlings are produced for sale. In parts of Kakamega District, for example, up to 40% of households have small nurseries (of approximately 500 seedlings) on their farm for seedling production (personal communication, Muso Enyole). At the Kakamega market, tree seedlings (mainly Cyprus and Eucalyptus) usually are available for sale on most days (price is 1/- per 10 seedlings). Surprisingly, it is the intensively

cultivated Districts, such as Kisii and Kakamega, where tree cover is especially good. For Kisii it is reported that tre resources are readily available, although because of excessive population growth demand is likely to outstrip supply in the near future (Ministry of Environment and Natural Resources, 1981). On most farms in highland Kisii, hedges are planted for boundary markers, and also can be used as a source of fuel (for a description of this practice in the Central Province, see Castro 1983: 15).[3] In another intensively cultivated area, Kirinyaga District, where population density in some sub-locations exceeds 500 per square kilometer, Castro (1983) notes the importance of tree planting. I quote (p.29):

> "Considerable tree planting by the local people has taken place in Kirinyaga. The majority of people are aware of the importance of trees. Many complain that there simply are not enough seedlings available at nurseries during the planting season".

He cautions, however, that:

> ...the tree planting that has taken place is probably still insufficient to meet existing and future demands. With the rapid growth in population, the demand for wood -- not only for fuel, but for building and other uses -- can only increase".

Most of the tree planting in Kirinyaga is "to provide timber, poles and firewood" (Castro 1983:30).

In Kenya's highland areas, there are important economic incentives to plant trees. First, fuelwood and building materials are usually monetized, so that self-sufficiency in these resources reduces household expenditure. Secondly, land is an extremely valuable commodity in these areas, and improvements (e.g. tree planting to protect terraces) that enhance its value and the value of its crops represent a visible economic benefit.

On-farm soil conservation measures (often coupled with tree planting, as indicated above) are widespread in the highland areas. However, it is questionable how effective most of the locally made structures actually are, particularly on slopes of 40° or more. For example, the Tiriki Abaluhya (Kakamega District) have a tradition of on-farm terracing, but the terraces only impede soil erosion minimally (personal communication, R. Were, Hamisi Division, Kakamega District). The most effective terracing observed in the area was done by wealthier farmers who could afford the labor (usually hired) required to build stone-reinforced terraces. Although some of the elders in

the highland areas recall with bitterness the enforced terracing of the late colonial period (see Meyers 1981), it is no longer an issue for most farmers. In fact, some of the terraces built under the ALDEV program (1950s) have continued to be maintained by individual farmers - the estimate for Hamisi Division is that approximately 20% of ALDEV terraces have been maintained.

The construction of other soil conservation works, such as cut-off drains and gabion weirs (across gullies), are also built on individual farms. For cut-off drains, which according to GOK requirements cannot exceed 400 meters in length -- permission must be sought from individual farmers before construction can take place. Meetings are held at the Location and Sub-location levels to solicit local opinion about potential sites for cut-off drains. A formal agreement is then made between the individual farmers (usually 2-3), whose land the drain is to traverse, and the Government. The agreement states in writing that the farmers will be responsible for maintaining the cut-off drain. In the majority of cases, the Ministry of Agriculture provides the labor for construction, and also may plant either napier grass or trees above the drain. Despite the formality of the procedures, less than half of the cut-off drains in some Districts (e.g. Siaya District) are maintained by the farmers (personal communication, Soil and Water Conservation Officer).

In the highland production zones, water distribution is more of a problem than water point development. Water sources usually are available but distribution to communities remains the critical issue. In many cases water schemes involve piped distribution from a given source, either by gravity or pump.

2.3 Midland Mixed Farming Areas

In the GOK agro-ecological classification system, this area approximately corresponds to zones UM-4, LM(1-5), and L(1-4). It includes predominantly the upper and lower mid-land zones, and those regions in the upper moisture limits of the semi-arid areas (i.e., 600mm per annum). In a geographical sense, it covers the northern and central parts of Machakos District, the Central Division of Kitui District, Central and Southern Baringo District, the lower midlands of Nyanza Province, the Kerio Valley of Elgeyo-Marakwet District, and most of the lowland areas of Meru and Embu Districts. For these areas, several good data sources are available that include information on local resource management. For example, for Machakos, see Meyers (1981); for Kitui District, see Mutiso (1979), Akong'a (1982) and O'Leary (1979); for Baringo District, see Little (1981;1983); for Nyanza Province, see Johnson (1979); for the Kerio Valley, see Kipkorir, Soper and Ssenyonga (1983); for lowland Embu, see Brokensha and Riley (1980) and Brokensha, Riley and Castro (1983).

The general characteristics of this production zone are as follows:

-- altitude is approximately 1000-1500 meters;

-- rainfall ranges from 600-900 mm per annum;

-- the production system is diversified with maize and millet the predominant cereal crops and small herds of cattle, sheep and goats also being important;

-- most of the land has been, or is in the process of being, individually adjudicated;

-- land holdings are on average approximately 10 ha., with considerable inter-District variation depending on demographic pressure;

-- out-migration for employment is important in most of the areas, but in some cases it may only be seasonal (e.g. Kerio Valley, see Dubel and de Kwaasteniet 1983);

-- sexual division of labor has drastically changed due to male absenteeism, and thus many traditionally male-oriented activities -- such as livestock herding -- are now done by females;

-- a large percentage of school age children are attending schools;

-- market value of land is generally low;

-- production of high value crops is minimal except in irrigated areas and near towns where vegetables may be produced;

-- indigenous work groups in agriculture remain important, particularly in Kitui, Machakos and the Kerio Valley; and

-- fodder grasses are rarely planted for pasture improvement.

Similar to the highland areas, soil conservation works in this area tend to be on-farm. This is particularly true for the predominant anti-erosion measure, on-farm terracing. The actual labor to construct terraces may be mobilized on a community basis. For example, Mwethya groups in Kitui and Machakos District often are used to construct on-farm terraces.

Farm terraces are constructed on the hillsides in most of these areas. In Machakos District, for example, Meyers (1981:93) found that 80% of households had bench terraces, and 62% of surveyed households had constructed cut-off drains (although many of the latter were not maintained). However, Meyers data reveal that there is a strong correlation between the cash value of the crops produced on the farm and a farmers' willingness to undertake soil conservation work. To quote (1981:97): "The more important crop sales to the farmer are, the

better managed is the shamba". If Meyers' conclusions can be generalized to other areas in this zone, then the implications are that for households which earn most of their income off-farm, and thus maintain the farm for purposes of supplying food for subsistence, the shamba will receive less management attention than the income-oriented farms. While this may hold true for the highland areas and the better rainfall areas of Machakos District, surplus production in the other regions is usually unattainable, except in the best rainfall years. In virtually all years, these midland areas import grains from elsewhere in the country. What should be remembered is that most households in this zone depend on marketing livestock and selling their labor to maintain viability. In many cases, agriculture is a supplemental activity, and those producers who are left only to farm usually have family members who remit cash earnings to the household. The returns to agricultural labor in these areas are such that non-farm employment opportunities are usually more lucrative.

In some of the midland areas, on-farm soil conservation works have increased considerably in recent years. For example, in the lower Tugen Hills of Baringo District, an area of considerable erosion, more than half of the farms in one location (Ewalel) have constructed

stone terraces on their land. While technical advice and some tools have been supplied by the Baringo Pilot Semi-Arid Area Project (BPSAAP), the labor has been supplied by the farmers.

Other anti-erosion measures, such as gully control using gabions, are done off-farm, and the willingness of communities to do this voluntarily varies among Districts. In the Kamba Districts (Machakos and Kitui), the presence of indigenous work groups, such as the Mwethya,[4] facilitates community involvement in the construction of such structures. The Machakos Integrated Development Programme (MIDP) in Machakos District, for example, has been able to mobilize local labor for many of its soil and water conservation activities. By contrast, in central and northern Baringo District, where local labor groups are few, only 12% of off-farm soil and water conservation efforts in the past two years have been done on an "harambee" (voluntary labor) basis (personal communication, Technical Assistant). Most of the local labor for construction in this area is paid for in cash or food allotments. It should be noted here that the residents of semi-arid Baringo are generally poorer than Machakos residents. It is most probable that this accounts for some of the differential response to "harambee" labor. The level of poverty affects whether or not a farmer is willing to commit his labor freely when it can be used to earn wages elsewhere.

The recent drought in most of these areas has seriously impacted upon the "harambee" spirit. In many of the mixed farming areas, "food for work" programs have been initiated for soil conservation and water projects. While it is agreed that "food for work" programs often dampen community commitment to projects (see Tiffin 1982), it should be recognized that if government and donors want to continue with soil and water conservation projects during drought years, then they are going to have to pay for local labor.[5] For a local neighborhood, resource management activities would not be undertaken in such years. Rather, all attention would be directed towards securing food. In many cases this would be achieved by selling one's labor and then purchasing food. If it is the case that "food for work" programs in soil and water conservation projects reduce long-term commitment on the part of the community, then it is questionable whether such activities should be undertaken during famine years. Perhaps it would be more prudent to distribute drought relief to those who are destitute than to tie it to a particular project, which then is identified as a government enterprise for the government to maintain. I will return to this point toward the end of the paper.

Local tree planting in these areas is important in selected locations (see Brokensha, Riley and Castro 1983), but is generally restricted to institutions (such as schools) and to women groups. For example, in both the CARE project in Siaya District and the USAID funded agroforestry project in Kitui District, most of the seedlings have been distributed to women's groups (in contrast with the earlier description of tree planting in Kirinyaga District). In many cases, the women's groups have established their own small nurseries for seedling distribution. While this can be considered "voluntary" tree planting, it stands in stark contrast to tree planting in the highland areas of Kakamega, Kisii and Kirinyaga. The former is mainly a direct result of government and donor intervention. It is questionable how much tree planting would have taken place in these areas without this external influence. It should be noted that most of these areas are major exporters of energy--in the form of charcoal--to other parts of the country. Under these circumstances, it is doubtful whether sufficient scarcity exists to motivate tree planting on the part of either communities or individuals.

Water is a scarce resource in the LM(4-5) and L(4) areas of the mixed farming zone. Dry season distances from settlements to permanent water sources range up to 10-15 kilometers in parts of Baringo and Kitui Districts, and water collection there requires a considerable allocation of labor. In most of these areas, water development is accorded the highest priority by the local people. I think it is generally true for these areas that the greater the scarcity, the better managed and maintained the water sources are. Digging wells in river beds in the dry season is characteristic of this zone. These water sources are very apparent in Kitui District, where there is a local preference for such water in comparison to water from dams. The latter are often major watering points for stock (Louis Berger International 1982). Such hand-dug pits--in most cases, no more than one meter in depth--can be either individually or collectively owned. They are usually fenced with local acacia bush. I observed in Kitui District, however, that individual wells were more likely to be fenced than were communal water sources.

There are several different organizations that are involved with water point development in these areas. First, there are local communities that have dug their own pits, wells, and in some cases small catchment dams. They are maintained and managed by the community. Second, there are water points that have been developed by the local community, but which have been supported by an NGO, often a church-related group. Wherever possible, the water distribution for these schemes is gravity fed. In general, there tends to be more local participation in the planning, implementation and maintenance of these projects, than is true for the government schemes. For example, the Catholic Diocese water projects in Machakos District require that the local community first submit a formal application with a processing fee before feasibility assessments are made (see Appendix III). If detailed surveys and design work are required, then the community is charged for these services. In some cases, they are unfinished RDF (Rural Development Fund) water projects that the community seeks assistance in completing; or they may be new schemes in which the community has already raised considerable funds. That the community (not the chief or Ministry) must initiate the process guarantees local participation in the planning. It should also evoke greater concern for the operation and maintenance of the water point when it is completed.

Finally, there are the government schemes which depending on the scale involve some local participation, particularly in the construction, operation and maintenance. In most cases, the community is asked to provide "harambee" labor for some of the construction and funds for fuel (if a pump is utilized) and maintenance. Unfortunately, the level of technology of many of the government projects, especially for boreholes and other mechanically driven systems, is such that local maintenance is usually ruled out. When pumps break down, the community first seeks assistance from the Ministry or a local NGO, and when this strategy fails, the scheme usually remains non-operational.

Of the three different avenues for water development mentioned above, the first two have had the most success in involving local participation. The actual development of new water points may be achieved faster through the government (often under donor pressure to meet an expenditure time table), but the maintenance and operation of these schemes usually is neglected. I think it is generally true that "if a project is government-planned, and implemented by paid labor, local people feel little commitment to maintaining it" (Tiffin 1982:12).

2.4 The Range areas

This production area corresponds approximately to the agro-ecological zones LM(6-7) and L(5-7) in the GOK classification system. While some dryland (sorghum and millet) cropping is present, as well as localized pockets of irrigated agriculture, the production system is predominantly based on livestock. There is considerable variability in the extent to which nomadism is practiced in these systems. As a rule, however, spatial mobility tends to increase relative to declines in annual precipitation.

This production area covers most of Kajiado District, the plains area of Narok District, Northern Baringo District, Samburu District, Turkana District, the lowland areas of West Pokot District, Marsabit District, Mandera District, Isiolo District, and the Eastern Division of Kitui District. Data on these areas are available from several sources. For example, for Kajiado District, see Campbell (1978;1981), Jacobs (1980) and Ole Pasha (1983); for Samburu District, see Spencer (1973) and Institute of African Studies (1982); for Turkana District, see Dyson-Hudson and McCabe (1982) and Ministry of Agriculture and Livestock Development (1984); for Isiolo District, see Dahl (1979), Hjort (1978) and Hogg (1983); for Garissa District, see Merryman (1982); for Tana River District, see Ensminger (1984); and for

Marsabit District, see Baxter (1975), Lewis (1977) and Lusigi (1984). It should be noted that because the physical resource base (i.e., range and water) has such an important influence on these production systems, there is probably more data on local resource management in these areas than for other regions of Kenya.

The general characteristics of these areas are:

-- communal or group ownership of grazing land;
-- low population density (2-4 per square km), especially in the extensive range areas;
-- an increasing trend towards sedentarization, particularly in irrigated areas and around towns and settlements;
-- severe environmental degradation around population concentrations associated with settlement and irrigation schemes;
-- considerable mobility of human and livestock populations;
-- an increasing trend toward out-migration to towns among young males (18-35 years);
-- a generally low attendance in schools by children, although attendance is on the rise;

-- an increasing diversification of livelihood activities, often incorporating wage employment;
-- food security is generally a problem, particularly in drought years;
-- very minimal availability of government services and infrastructure in most areas; and
-- net exporter of energy in the form of charcoal, particularly in those areas where tarmac roads recently have been constructed, allowing for easier access to urban markets.

The management of grazing and water are the core resource management activities, and thus the following discussion will be limited to these two resources. Except in unusual cases (e.g., around irrigated areas), I do not know of any pastoral communities where soil conservation and forestry activities are major concerns. It should be noted that small-scale irrigation management is dealt with in the next section, since it is an important topic that is of concern not only to the arid areas, but also to the mixed farming zones.

The evidence is inconclusive as to the effectiveness of pastoral institutions and strategies for managing range resources, particularly given the changing parameters under which these systems operate. In many parts of Kenya, loss of both dry and wet season grazing due, in part, to game park development, agricultural encroachment, or general insecurity makes the debate over the effectiveness of pastoral institutions appear antiquated. What is clear, however, is that most pastoral societies in Kenya had ways, or even formal institutions (such as the Olokeri system among the Il Chamus), which served to regulate access to seasonal grazing. In some cases, it may have been unintentional; for example, the Kajiado Maasai's practice of restricting human settlement in certain grazing areas serves to create a dry season reserve (personal communication, Barbara Grandon). Obviously, the effectiveness of reserving areas for certain times of the year is contingent on the productivity of non-reserved areas. Where population pressure has increased and the use of wet season areas is excessive, it is unlikely that dry season areas will be restricted. For example, the productivity of most of the wet season grazing in central Baringo is so low, that herds are maintained in dry season areas for most of the year, leaving only minimal reserves for drought years such as 1984.

It is generally true that in the more arid, nomadic areas, such as Turkana and Isiolo Districts, there are very few restrictions on grazing other than between particular sections of the society or between different ethnic groups. For Southern Turkana District, Dyson-Hudson and McCabe (1984:27) note that: "Although free access to pasture within the boundaries of South Turkana sections is available to all members of that section, if sectional boundaries are crossed, permission to use the pastures and water resources must be sought from the elders of the section to be entered". In Isiolo District, there appears to be even less restrictions on grazing: "Within the Boran community, there is no recognition of pastoral land as belonging to certain groups and not to others, other than that for practical reasons, the camel owning Sakuye used to occupy certain areas useful for camels.... many Borans had, and still have, strong feelings about the immorality and danger of reserving pasture for the exclusive use of certain groups in an area with very scanty and irregular rainfall" (Dahl and Sandford 1978).

In summary, if there is a general conclusion about the pastoral strategy of reserving areas for certain times of the year, it is that its frequency tends to decline

aomng the more nomadic societies. Put simply, the rationale of reserving areas for certain times of the year is inappropriate, when it is likely the community will not be there during the period it should be utilized.

Most of the resource mismanagement observed in the extensive range areas is in proximity to irrigation settlements and other population concentrations (Hogg, forthcoming; Ministry of Agriculture and Livestock Development 1984; James Ellis, personal communication). Around settlement areas, resource management tends to break down as conflicting uses of the land begin to compete with each other. These include: (1) investment in livestock by irrigation farmers, who then graze the animals nearby; (2) maintenance of milk herds in the area by pastoralists and townsmen to meet the demand for milk in the settled areas; (3) the deforestation of tree resources near the settled areas to meet local charcoal and fuelwood needs; and (4) the maintenance of herds by traders and businessmen in the settled areas, stock which will eventually be exported from the area. The resource management implications of these developments will be further addressed in the section on "Gateway Towns."

The availability of water resources greatly influences the condition of the grazing resources which, in turn, affects the economic viability of the system. While grazing pressure is often heaviest around permanent sources of water (see Lusigi 1984), it does not seem to have created the same degradation that occurs elsewhere in Africa (e.g., Sahel). Perhaps part of the reason lies in the fact that in many of the drier areas of Kenya permanent water schemes (e.g., boreholes) that are likely to attract large numbers of stock are either not functioning due to mechanical problems or are not present. In all of Isiolo District, there are no more than three boreholes presently functioning in the range areas, and in the Northeast, as of the late 1970s, less than half of the boreholes developed under the National Range Project were operating (DEVRES 1979). In other areas, such as Southern Turkana District (personal communication, James Ellis) and most of Marsabit District, no boreholes have yet been developed.

Dry season water in these areas usually comes from hand dug wells that can be either owned individually or by a group, such as a clan. Because the daily yield potential of these sources is low, they are unlikely to lead to large concentrations of stock in the vicinity. The management of the indigenous dry season water sources tends

to be generally good (Dahl and Sandford 1978), and there are usually individuals or groups of individuals responsible for their maintenance. In Southern Turkana District, where no boreholes exist, it is noted that vegetation actually seems to have improved in the past decade (personal communication, James Ellis).

Surface water in the arid areas, with the exception of perennial rivers (e.g. the Uaso Nyiro and Tana Rivers), usually is available only during the wet season. Water structures (e.g. water pans and dams) that have been constructed by government in wet season grazing areas usually are beyond the maintenance capabilities of the local community. Their excessive size necessitates a "grader" in most cases to repair the embankments and de-silt them. Many of the ALDEV water pans and dams that were constructed in these areas were non-operational after a short period of time due to maintenance problems. This is in spite of the fact that many of the structures were located in good sites (Institute of African Studies 1982).

3. Examples of Local Management and Participation

There are several examples of good local resource management on the part of local communities in Kenya. For the most part, management is enhanced when the particular

resource has a direct linkage to production, or when it is scarce enough that good management is required to sustain it. Below I present three different examples where good local management and participation is voluntarily practiced.

3.1 Small-scale Irrigation

While the management and efficiency of small-scale irrigation in Kenya varies considerably among different areas (see Hogg 1984; Little 1983), there are several locations where it has been especially successful. Of the different resources, water for irrigation tends to be managed by more formalized institutions than is the case for other resource management activities. Here I refer to two different examples of small-scale irrigation: Marakwet and Taita irrigation. While one is well documented in the literature (Marakwet) (see Kipkorir, Soper and Ssenyonga 1983), the other has received little attention (Fleuret 1984). Both are cases where good local management has resulted in relatively efficient systems.

In the Marakwet area of the Kerio Valley, irrigation is managed on the basis of clans, and in some cases sub-clans. As Soper (1983:91) notes, "the water ownership unit is the clan section or, in some cases, sub-section, which is also the land-holding and the basic residential

unit". A clan or a group of clans will own a particular furrow which they are responsible for managing and maintaining. Water from the furrows is allocated on a rotating basis to members of the clan, usually based on a 12 hour watering unit, or fractions of the unit (Soper 1983). Most agriculturalists who have surveyed the furrow system note its efficiency in providing a secure source of water. They also indicate the community's commitment to maintaining it (Critchley 1983). There are approximately 48 furrows operating in lowland Marakwet, "with an average of 413 families using each, or close to 90,000 people living off the irrigation system "(Capon 1984:4). While the latter figure is perhaps optimistic, there is, nevertheless, a population density in the irrigated areas that is three to four times higher than elsewhere in the Kerio Valley.

Even in the poorest rainfall years, the lowland Marakwet are usually food self-sufficient and are able to market a surplus of grains, fruits and vegetables. In fact, it has been noted that rarely has the lowland Marakwet area required famine relief (personal communication, William Critchley). This stands in stark contrast to neighboring areas (e.g. Turkana and West Pokot) where food relief is required in most years.

Taita small-scale irrigation also is locally managed and maintained, and there has been no outside investment in the system. The following lengthy quotation from Fleuret (1984:15, 22) describes Taita irrigation:

> The Taita system is somewhat unusual in that it seems to have passed through the events of the last 100 years or so without notably adverse consequences; this despite the efforts of British-era administrators, who regarded the Taita furrows as 'unscientific' and 'wasteful' and who attempted at intervals to correct this. Ironically, three or four 'scientific' irrigation schemes implemented during the 1950s as part of the Taita Betterment Program all failed. It proved difficult to better or even match the performance of the indigenous systems.
>
> The system to be described here is located along the upper reaches of the Mwatate River....(which) lies in a steeply-banked and steeply-inclined gorge; in the space of about 2.5 Kilometers 16 furrows lead off along the contours of the adjacent slopes ... For maintenance the basic rule is that those who benefit from a particular furrow or outtake are responsible for maintaining it... Each main canal leading off from the stream is the

responsibility of a canal committee (Njama ya Mkua), composed of a chairman and a small number of members drawn from user households. Each set of agnatic kin that views itself as somehow distinct from other groups will wish to be represented on the committee, which can be expanded as required to meet such needs".

Both the Taita and the Marakwet systems are based on gravity flow, and thus maintenance can be accomplished at the local level. In short, "not much can go wrong with such a system, and when something does break it is esily repaired with the skills and materials at hand" (Fleuret 1984:32).

Contrast the above scenario with the small-scale irrigation development in Turkana and Isiolo Districts. In both cases, capital and management intensive schemes were advocated, and in some cases costs per irrigated hectare were as high as $60,000 (Ministry of Agriculture and Livestock Development 1984). Pumps were depended upon for water delivery, and in many cases total irrigation systems were left non-operational for 2-3 years at a time due to machinery failure or lack of diesel (see Hogg 1983). Management systems, in turn, were imposed upon the local

producers, and very little local participation was encouraged. To quote one source on the Isiolo irrigated cluster (Ministry of Planning and Development 1982), there is "a paternalistic project management and a lack of concern for farmer training, cooperation, and tenant participation in management". It should be noted here regarding Isiolo irrigation that the most successful scheme (Garfasa) is gravity-fed and under the management of the local community. The management structure at Garfasa resembles indigenous Borana social institutions. Consequently, "the system works well; the community rightly feels in control of the scheme; committee decisions are respected; and the morale of Manager and tenants is high" (Ministry of Economic Development and Planning 1982:61).

3.2 Reserved Grazing in Kajiado District

The Maasai of Kajiado District have several different strategies for managing range resources. Jacobs (1980:287) indicates some of these as such: "elaborate grazing sequences (including irregular rotation as well as simple alteration) based on systematic reconnaisance of, and movement to, grazing flushes in order to create standing hay in the dry-season reserves; regular use of donkeys to carry water for immature livestock and human consumption, both to expand the grazing area and to permit camps to stay

away from their dry season reserves as long as possible; detailed knowledge about the nutritional value to livestock of a wide range of grasses, herbs, and tick seeds, and use of these at the appropriate stage of their growth.... and regular social rebuke and avoidance of families or camps that fail to adhere to good management practices in their locality".

A more formal mechanism than the above for reserving grazing in Kajiado is the Olpololi system. In short, the Olpololi is an area located near a homestead (or collection of homesteads) that traditionally was reserved for calf grazing. These areas can range between 100-800 hectares, and in some of the group ranches can account for as much as 20% of total available grazing. Below I describe the use of reserved grazing (Olpololi) in one group ranch, Merueshi (based on de Souza and de Leeuw 1984). It should be noted that it is not known how generalizable the Merueshi situation is for other Maasai locations.

In the Merueshi ranch, there are 13 reserved grazing areas, of which two are managed by single producers, while the others are managed by more than one herd owner. Most of the reserved areas are located near permanent water

facilities. The aggregated reserve area is approximately 4,500 ha. or 20% of the ranch (de Souza and de Leeuw 1984). During the dry season, producers must seek permission from the homestead heads associated with a particular reserved area before they can move across it.

In recent times, adult cattle and small stock have begun to utilize these reserved areas. Within the Olpololi, the grazing is sub-divided and certain stock species are restricted to grazing only on certain parts of the Olpololi. For example, kids, lambs and young suckling calves are kept in one sub-section of the Olpololi; while adult cattle, mature small stock, and non-suckling calves each have their own sub-areas. Some of the wealthier stock owners have used these Olpololi for fattening cattle, which are then marketed (personal communication, Myrtle de Souza). It is noted that "according to Maasai informants the basic objective in the management of reserved grazing areas is that grazing resources are used in a manner to ensure conservation and annual regeneration" (de Souza and de Leeuw 1984:9).

The Merueshi area, similar to other Maasai locations, has certain distinguishing factors that differentiate it from other livestock areas in Kenya. First, the Maasai are full-time herders that depend solely on their herds for

their livelihood. It is generally true that full time specialized livestock producers are usually more conscious of conservation than are agro-pastoralists and settled farmers who also keep livestock. For the latter, there are other economic activities to rely on if problems arise in the livestock sector.

Secondly, the Maasai of Merueshi consider their homesteads to be permanent, and thus reserving areas near their settlements allows annual use of the restricted grazing. Contrast this situation with that described earlier for the Borana and Turkana nomads of Isiolo and Turkana Districts.

Nevertheless, the point which should be made here is that voluntary local resources management is practised among producers. But in this case, it is taking place at a level (sub-location and smaller) which is below the level of the group ranch. This raises the question whether or not the ranch committee and ranch unit size is too unwieldy to effectively manage range and water resources at the local level. The question of the appropriate level to intervene for local resources management will be discussed in Section (5).

3.3 The Scarcity Factor and Its Relationship to Water Management

Roe (1984) discusses the general relationship between water scarcity and good management. He (1984:4) notes that:

> when it is the dry season and reliable water points are few, rural people increase the management of these group or communally-held water sources, ie. they manage reliable water sources, but it is management under stress. However, in the wet season, as alternative and more convenient water sources increase, there is typically a decline in the management expended per water point and for all water points used.

Roe further points out that the government's point of view is actually contrary to the realities, in that it expects improved water management will go along with increased water supplies.

While I question the generality of the scarcity argument for other resources, I feel that it generally applies to water point management. One need only examine the plethora of non-functioning water schemes in Kenya's better watered areas to be convinced. In these locations, rather than invest in maintenance and operation costs, local people often revert to their lower cost water sources, such as rivers. I visited two schemes in the highland areas where communities were drawing water from communal sources within 50 meters of a non-functioning water project. In both cases, the commitment required from the community--in terms of funds and management--exceeded the benefits they derived from the new water point.

In another case, I visited a highland water scheme which was left unmaintained because water charges to consumers were required to meet recurrent costs. Since a perennial river was located near the scheme, the majority of the community opted for this source, rather than pay water fees. In such cases, government's expectations are out of line with what the community feels is the worth of a new water point.

At the other end of the spectrum is the management of water points in the arid areas. As noted earlier, these often involve wells dug in river beds during the dry season. Management and maintenance of these water points tends to improve as the dry season progresses. Even in the case of boreholes, funds for operation and maintenance are more easily mobilized from the community during periods of water scarcity. For example, the borehole at Yamicha, (Isiolo District approximately 100 kilometers north of the Uaso Nyiro River), which has been inoperative for several years, was opened during July 1984. The local herders raised the funds necessary to buy parts and operate the borehole, and the government, in turn, provided the technical services, as well as some of the equipment, necessary to repair it. In this case, the herders sought government assistance, and because of this probably saved several hundred head of cattle from dying.

In sum, the scarcity factor is critical for government to take account of in the design of water projects. As I have shown, it very much influences community willingness to share the costs of construction, operation and maintenance.

4. Local Resource Management in the Context of "Gateway" Town Development

Perhaps the most significant process which has occurred in Kenya's ASAL areas over the past decade has been the rapid growth in the number of small urban centers (population between 5,000 - 20,000). While not going into all the different factors responsible for this phenomenon, it is worth noting that the improved transport infrastructure, a general demise of the pastoral sector (due to drought, disease and security problems), a growth in business investments, the attraction of wage employment, and the development of irrigated agriculture, are among the more important variables.

The importance of the centers in providing essential services, agricultural commodities and employment opportunities for the surrounding areas is recognized by government. Indeed, these "gateway" towns receive high priority in the most recent five year plan (1984-1988). I quote (Republic of Kenya 1983:59, 176):

> "The development of selected urban centres is central to this task because they provide direct services to this catchment populations and intermediate services to the many non-urban centres within their service-areas. The first priority in this regard must be given to those centres designated as "gateway towns" in the last plan....

These towns are Lodwar, Kapenguria, Maralal, and Kitilu in the Kerio Valley region, Mandera, Wajir, Moyale, Marsabit, Garissa, Isiolo and El Wak in the North-Eastern Kenya, and Kitui, Bura, Kajiado, Lamu, Narok and Voi in the Southern region. These towns have been selected because of the strong relationship they have with their regions".

It should be further noted that most of the small and intermediate sized towns have been growing considerably faster than Kenya's largest three cities: Mombasa, Nairobi and Kisumu. The settlement (urbanization) process has been especially accentuated in Districts, such as Isiolo and Turkana. While over half of the population in Isiolo District live in urban centers of 3,000 or more, in Turkana District presently 46% of the population resides within five km. of permanent settlements (Ecosystems Survey cited in Hogg, forthcoming). In both areas, the number of settled residents was negligible until the mid-1960s.

4.1. The Regional Benefits of Town Growth

There are several beneficial linkages that "gateway" towns maintain with their rural hinterland. Perhaps the most important is the grain (posho) marketing linkage (Little 1983). A distinguishing characteristic of these

towns is that they usually are wholesale or bulking centers for the grain trade, serving the various retail centers in the surrounding region. While the importance of this connection is most apparent in years such as 1984, when grain demand is especially high, in all years grain makes up the major import in these regions. The seasonality of food production in pastoral systems necessitates large imports of grain during dry season months. What happens in particularly bad years is that the availability of grain is usually restricted to "gateway" towns and their immediate catchments. Thus food security problems in the ASAL areas tend to increase proportionately to distance from these centers, which accounts for the large influx of people to such towns during drought years.

On the production side, these towns serve as major market places for locally produced commodities, such as livestock. Traders buying stock from the pastoral areas often are based out of "gateway" towns. In most cases, the stock is exported out of the region, but an increasing proportion is consumed in the centers, generally via local butcheries. Markets for pastoral milk also are developed in these centers.

The "gateway" towns play a major role in facilitating economic diversification among surrounding households. This is in terms of providing alternatives to pastoralism regarding both employment and investment. Individuals who are no longer viable pastoralists seek employment opportunities in these centers; while rich, successful pastoralists look for alternative investments, often buying town plots, local retail businesses or matatus (bush taxis).

Finally, the multiplier effect of these center is considerable, and is evident by the proliferation of local service and consumption-oriented industries. These include: auto repair shops; posho mills; small furniture industries; electronics repair shops; handicraft industries; small honey processing facilities; health services (government, and in some cases private); agricultural input suppliers; and banking and credit facilities. The impact of these employment and service-oriented activities is felt by communities up to a radius of 50 km. In a development sense, they serve to retain local surplus and capital within the region.

4.2. The Environmental Costs of Population Concentration

As indicated earlier, resource mismanagement is considerable around these towns. In section 2.4, we listed several of the competing, and often conflicting, landuse

activities surrounding these centers. They tend to be especially a problem around Isiolo and Kitilu (Turkana Districts) towns, and among the smaller centers in both Turkana and Isiolo Districts (Ministry of Agriculture and Livestock Development 1984). Around these settlements there "has been heavy pressure on the natural resources (as a result of a large concentration of people and stock in a small area) and an accelerated breakdown of regulative means of resource control" (Broch-Due & Storas, cited in Hogg, forthcoming). To my knowledge, there is no local control of grazing around "gateway" towns and in cases large traders have fenced off parts of the surrounding range for their own herds (see Dahl and Sandford 1978).

4.3. The Need for Planning and a Better Understanding of Rural - Town Linkages

There is a clear need for informed landuse planning in the "gateway" towns and in their surrounding hinderland. At present the growth of these centers remains uncontrolled. Because of the emergence of competing interest groups, who have different objectives for using the surrounding land and resources, a landuse plan and policy for these areas should be formulated. Such a plan might include: (1) the afforestation of restricted areas to meet

town charcoal and fuelwood demands; (2) delineation of agricultural areas for production of produce for the local market; (3) recognition of surrounding grazing for use by local pastoralists; (4) limits on local range used by milch herds to supply the local milk market (see Dahl and Sandford 1978); (5) in some cases, the development of a holding ground for stock traders' herds; and (6) limitations on the burning of charcoal in areas near the town.

What is equally required in the context of small town development is a better understanding of the linkages between the centers and their rural hinterland, and between the centers and larger municipalities outside of the region. A knowledge of critical resource, marketing (especially grain) and labor (i.e., migration) ties is particularly important. Despite the recent profileration of research in ASAL areas in proximity to "gateway" towns, there still are several important gaps in our knowledge. FOr example, I know of only two towns in north Kenya - Kapenguria and Isiolo -- where systematic data are available on the ethnic and employment characteristics of migrants entering the town (see Reynolds 1982; Hjort 1978). More noticeable, however, is the almost complete lack of data on grain marketing linkages between "gateway"

towns and the surrounding smaller retail centers. This is particularly apparent in the severely grain-deficient areas of northern Kenya (for an exception, see Njiru 1982), where grain distribution is a serious problem. Since the government has emphasized the development of "gateway" towns because of their strong ties to the surrounding region, it is important that these linkages be understood.

5. Identifying the Appropriate Level for Management and Participation

It is encouraging that in most of Kenya's Districts the participation of local communities in the planning, implementation and maintenance of resource-based projects is given high priority. In Districts where there are area development programs focused on soil, water and range conservation -- for example, Baringo, Elgeyo-Marakwet, Kitui, Machakos, Embu, Meru and Isiolo Districts -- local involvement is an especially important agenda item. However, the impetus for local participation has mainly come in the last few years, often as a result of the poor maintenance record of local resource-based projects. Moreover, as indicated earlier, the fiscal and administrative costs to government of implementing local resource management necessitates greater cost sharing by local communities. Yet, because this mandate for greater local participation is so recent, it is difficult

to judge the government's performance in accomplishing the new goal. At this point, therefore, it is critical to examine the direction that such local participation should take.

5.1 Planning versus Implementation and Management

Decentralization in Kenya has received considerable attention on the part of government, and in the most recent five year plan it is reflected in the new "District Focus". Development plans are formulated for each District. These are supposed to serve as a planning tool for District-level officers responsible for planning and implementing projects. But is the District, or even the Division, the appropriate level for overseeing the management and maintenance of resource-based projects? I shall try to answer this question below.

A characteristic of local resource management in rural Kenya is that the major management decisions are made on a daily basis by the local community, or by a small collection of communities. In administrative terms, this unit of management most closely approximates the sub-location. Where the management of soil, grazing, and water is particularly integral to the local economy, grazing blocks, group ranches, and District soil

and water conservation units may prove too large and cumbersome for influencing effective local resource management. Most local resouce-based activities are associated with a smaller spatial entity: a reserved grazing area is for a particular cluster of homesteads; a water point is managed by a single neighborhood; and a small irrigation furrow is for use by a local clan. It is at this level that one finds the decision-makers, who in the long run will have the greatest effect on resource conservation.

In evaluating a range management program in Isiolo District, Dahl and Sandford (1978) point to the importance of organizing producers at the sub-location for managing water (and in some cases range) resources. They argue that while the grazing blocks are too small to account for seasonal stock movements, these units are too large to effectively organize people for local resource management. I think a similar argument can be made for the group ranches in Kajiado District. In these cases, a distinction must be made between two different spatial units: the local level (sub-location) where actual management and maintenance is organized, and the larger areas (e.g. group ranch, grazing block or catchment area) which represents an ecological unit that may or not approximate the boundaries of these localized activities.

The decentralization of resource management responsibilities to the local-level takes advantage of an already available administrative unit: the sub-location. At this level, there are sub-chiefs (who often have a much closer identity with the local people than do chiefs), and in an increasing number of cases, there are sub-location development and soil and water conservation committees. Of course, the institutional infrastructure in the sub-locations varies considerably among different Districts, with seemingly greater prevalence of institutions in highland Districts (e.g. Kakamega and Kisii).

Using the sub-location as the appropriate unit for organizing local participation complements the government's new "District Focus". While planning and advisory services and technical backstopping would be done at the District and Divisional levels, the actual unit of management and responsibility for small-scale resource management projects would be the sub-location. The sub-chief and other local leaders would be responsible for ensuring that, for example, a local water point was maintained. At the District level the overall allocation of financial resources and projects among the different locations and sub-locations would be monitored.

5.2. Recognizing Informal Organizations and Strategies

Within sub-locations there often are several local organizations (both formal and informal) present. And these, in turn, can be used to mobilize local participation in resource-based projects. Organizations involved in these activities include: (1) Women groups; (2) self-help groups (usually organized to accomplish a single function - e.g. construction of an irrigation furrow); (3) Mwethya groups (in the case of Machakos and Kitui Districts); (4) local water committees; (5) sub-location development committees; and (6) local church groups. For an organization to receive government assistance, it must be registered with a Ministry, usually the Ministry of Culture and Social Services.

There are non-registered groups (defined here as "informal") that assume, or could assume, an active role in local resource management. These include indigenous irrigation committees; local elders' councils; savings and rotating credit groups (found to be important in Machakos District and in Western Kenya); and reciprocal labor groups (e.g. the Sikon in Elgeyo-Marakwet District). It should be noted that many of these groups have loosely defined membership and rules. Nevertheless, they should be taken account of as possible vehicles for mobilizing

participation in local resource management programs. In fact, they can be more integral to the community than are organizations, such as women's groups, which often are formed through outside encouragement.

Social scientists and planners alike often are obsessed with the potential role that formal institutions and organizations can play in the development process. In many cases, a formal committee or group must be organized before implementation of a small-scale project (e.g., water) can take place. It is felt that if a formal structure is present, then local participation and responsibility will be enhanced. Particular attention is accorded to those local institutions already in place that can be "formalized" to meet the organizational requirements of a project. Yet in the process of formalization, in addition to adding new demands to the group as a result of a project, the strength of the local institution can actually be undermined. Moreover, the new demands required of the group may not be consistent with the original intent of the organization. For example, projects that attempt to mobilize Mwethya

groups for labor contribution often fail, if they neglect to realize that work schedules must be coordinated with the groups' participation in agricultural activities (Tiffin 1982). As one civil servant in Eastern Province explained to me, outsiders often expect too much from Mwethya groups.

In the search for the institutional connection, projects can overlook important resource management activities that may be occuring outside of local organizations, committees and institutions. For example, few of the sandy river-wells, which we have shown to be the major dry season water source in large parts of Kenya, have committees; nor are organizations associated with the reserved grazing areas in Kajiado. Yet I have indicated that both of these resources are managed relatively well -- access to grazing is regulated without an organizational structure and hand dug wells are maintained by the producers themselves. Could these resources and management practices be improved? The answer is affirmative, although it is questionable whether or not a formal organization is required.

The water point development approach that the Machakos Catholic Diocese has taken (see Appendix III) is one possible avenue for assisting small-scale projects

without the requirements of an organization. In this case, the local community must actively solicit water development assistance. It must share in the costs of development, and must be responsible for the maintenance and operation of the scheme. The Catholic Diocese provides a matching grant to the community to enable it to complete an effort that it had initiated. As long as local resources are mobilized for the effort, the presence of a committee is not a prerequisite. This type of approach seems appropriate to small-scale resource management projects.

6. Policy and Planning Issues

In this section, I discuss the policy and planning implications of the previous discussion. Certain of these issues have been considered in the bulk of the paper.

6.1. Giving More Attention to Maintenance Costs in the Planning of Resource-Based Projects

The maintenance costs and requirements of a project influence the level of local participation that can be expected. Contrast, for example, the participation typical of the Marakwet and Taita irrigation systems with the local involvement in irrigation projects in Turkana and Isiolo Districts. As we have indicated earlier, the most serious

maintenance problems are with water projects--whether for household,livestock,or agricultural purposes, or some combination of these. Virtually all District water officials interviewed pointed to maintenance as the most serious problem with water schemes.

But how does the maintenance issue translate to specific recommendations for resource-based projects? Consider here, for example, the maintenance costs associated with different types of water technologies and projects. The following data are drawn from Louis Berger International (1982:F.51).

Maintenance Costs

Item	Annual Percentage*	Lifetime (years)	Cost (KShs)	Cost per m^3 Water
Shallow Well	1	30	42,300	.005
Borehole	1	20	80,000	.2
Rock Catchment	0.5	40	222,000	.15
Dam Reservoir	2	25	317,000	1.1
Intake	2	30	32,260	.02
Spring	2	30	100,000	.03
Sub-Surface Dam	1	15	311,000	1.64
Hand Pump	3	15	8,500	.04
Driven Pump	6.5	10	100,000	.08

*Percentage of total costs for annual maintenance purposes.

The figures in the table do not include operating costs, which are generally determined by amount of staff and labor required, nor the costs of power (in the case of pump-driven water sources) for operation. The annual costs of borehole and driven pumps rise considerably when fuel costs are considered. For example, it costs approximately .30 Kenya shillings per cubic meter of water at a depth of 10 to 15 meters. The data above also do not draw attention to the fact that fuel and parts may not be available locally, even when sufficient financial resources can be obtained to purchase them. Further, the table gives no indication of the extent to which local maintenance can be done by the local community, as opposed to being done by outside organizations. As I indicated in Sections (2) and (3), the

scale of technology often determines whether or not the community will have to depend on outside parties for maintenance.

Nevertheless, the data presented above do provide an indication of the costs of different water technologies. This becomes very important when it is expected that local maintenance costs are to be provided by the local community. In this respect, the least costly technology to the consumer, per cubic meter of water, will be a shallow well, and the most expensive will be a sub-surface dam, followed by a dam reservoir, and then a borehole. It should be noted that, depending on the depth water has to be lifted, a borehole could end up being the most expensive technology when both maintenance and operating costs are calculated. For example, in fuel costs alone, water from a borehole of 120 meters in depth (not unusual for northeastern Kenya) will be approximately 2.6 Kenya shillings per cubic meter (Louis Berger International 1982:G.54).

6.2 The Promotion of Small-Scale Projects

Many of the local resource management strategies practiced in Kenya would be inappropriate for large-scale projects. The Sandai example in Section (1) demonstrates what can happen to local initiative and management when a large project is imposed on a relatively efficient resource management system (irrigation in this case). Many of the local systems - particularly those involved with small-scale irrigation and dry season wells - need only incremental improvements, rather than massive changes. In most cases, what is needed is "a movement away from large-scale and/or blueprint projects to a deeper appreciation and exploitation of local diversity in accelerating rural development" (Roe 1984:9).

But is government the appropriate vehicle for promoting development at this level? There are successful examples where government has made incremental improvements to local resource management practices - e.g., improved terracing and self-help irrigation in Baringo

District and small-scale water development in Machakos District - but in many of these cases, there was an intervening variable: i.e., donor involvement and investment. Whether or not, this factor was responsible for the improvement, I cannot say. What is clear however, is that government should learn from these examples, and institutionalize a process whereby they themselves can make these small-scale investments without jeopardizing local participation and management.

In certain cases, the government should recognize its limitations for directly intervening in local systems. Instead, it might be more prudent for it to allow NGO groups to implement these smaller projects (e.g., small-scale water point development), which they have more experience with than does government. The government could then serve as a coordinating body, providing technical and administrative backstopping for these smaller projects. While the record is mixed, it is generally true that for resource-oriented programs government does better at providing infrastructure support (e.g., establishing a main water line), than in implementing smaller projects. I think the inverse of this holds true for NGOs.

6.3 "Gateway" Towns and the Need for a Land Use Policy

There is an important role that government policy can assume in the "transitional" resource management zones. Often these are in the catchment area of "gateway" towns, at the interface between agricultural and pastoral land use systems, or surrounding settlement/irrigation projects. In these areas, improved local resource management is contingent on a land use policy that identifies the rights of different groups of producers vis à vis other groups. Until access rights are determined (at a level beyond the local community, i.e. government) then the "free for all" and over exploitation of resources associated with towns, such as Isiolo and irrigation schemes, such as Kitilu, will continue.

6.4 Moving Responsibility Close to Producers

While the District focus represents an important transition to better local participation in planning, I have shown that in most cases, a unit well below the District is required for effective local resource management. For small-scale resource projects, it is suggested that the sub-location be used as the management unit. Responsibility

for management and maintenance would be for the local leaders and organizations within the sub-location. They also would be responsible for settling land use and water conflicts that might arise. It is at the sub-location level where improvements in local resource management should be made.

F O O T N O T E S

(1) For example, it is pointed out in the recent Isiolo District Plan (1984-1988) that only 27% of the water projects listed in the previous five-year plan were completed. This was due to limitations of funds (Ministry of Finance and Planning 1983).

(2) The agro-ecological zones used in this paper, based on Ministry of Agriculture (1983), are:

LH 1	Lower Highland Zone	(humid)
LH 2	" " "	(subhumid)
LH 3	" " "	(semi-humid)
UM 1	Upper Midland Zone	(humid)
UM 2	" " "	(subhumid)
UM 3	" " "	(semi-humid)
UM 4	" " "	(transitional)
LM 1	Lower Midland Zone	(humid)
LM 2	" " "	(subhumid)
LM 3	" " "	(semi-humid)
LM 4	" " "	(transitional)
LM 5	" " "	(semi-arid)
LM 6	" " "	(arid)
LM 7	" " "	(perarid)
L 5	Lowland Zone	(semi-arid)
L 6	" "	(arid)
L 7	" "	(perarid)

(3) Elsewhere in Africa it has been pointed out that trees often are planted to reinforce land title claims (Horowitz 1982). I did not explore the validity of this for Kenya, but I suspect that it is sometimes the case there as well.

(4) These are the indigenous work groups in Kamba society that are most important in agricultural activities.

(5) President Moi indicated in a Nairobi daily newspaper on August 6, 1984, that harambee projects should be halted in the drought-affected areas until after conditions had improved.

APPENDIX I - Field Sites Visited

1. Soil Conservation Works, Endau Sub-Location, Baringo District
2. Noloroto Self-Help Irrigation Scheme, Eldume sub-Location, Baringo District
3. Beijer Institute Forestry Plot, Meisori, Il Chamus Location, Baringo District
4. Loiminange Self-Help Irrigation Scheme, Baringo District
5. Soil Conservation Works, Patkwanin, Baringo District
6. Soil and Water Conservation Work, Koriema, Baringo District
7. Muserech Water Point (Dam), Soi Ranching Company, Eldama Ravine Division, Baringo District
8. Kiptoro Borehole, Kerio Valley, Elgeyo-Marakwet District
9. Chief's Nursery, Kabulwo, Kerio Valley, Elgeyo-Marakwet District
10. Chegilet Water Scheme, Kerio Valley, Elgeyo-Marakwet District
11. Small-Scale Irrigation Scheme, Kerio Valley, Elgeyo-Marakwet District
12. Beijer Institute Agro-Forestry Nursery, Kakamega Town, Kakamega District
13. Ministry of Energy and Regional Development Afroforestry Center, Bukura, Kakamega District
14. Shirula Water Scheme, Kakamega District
15. Farm Terracing Works, Hamisi Division, Kakamega District
16. Anti-gully Erosion Works, Hamisi Division, Kakamega District
17. Soil and Water Conservation Program, Tiriki Location, Kakamega District
18. CARE Agroforestry Center, Siaya Town, Siaya District
19. Farm Terracing Works, Siaya District
20. Bula Besa Small-Scale Irrigation, Isiolo District
21. Urban Water Scheme, Isiolo Town, Isiolo District
22. Women Group Irrigated Farms, Isiolo Town, Isiolo District
23. LMD Holding Ground, Isiolo District
24. County Council Livestock Dip, Kinna, Isiolo District
25. Bibi Water Pan, Garba Tulla Division, Isiolo District
26. Duce Water Pan, Garba Tulla Division, Isiolo District
27. Sandy River Wells, Garba Tulla, Isiolo District
28. Shallow Rock Wells, Garba Tulla, Isiolo District
29. Forestry Department Nursery, Isiolo Town, Isiolo District
30 Farm Terracing Works, Central Machakos District
31. Aldev Soil Conservation Works, Central Division, Kitui District
32. Kiina Water Scheme, Central Division, Kitui District
33. Sandy River Wells, Mutoyani, Kitui District
34. Concrete-lined River Wells, Nzeungati, Kitui District
35. Sub-Surface Water Dam, Central Division, Kitui District

APPENDIX II - Individuals Contacted

Nairobi

Professor T. Ryan, Director of Planning, MFP
Mr. John Kidenda, Senior Planning Officer, MFP
Mr. Joshua Ng'elu, ASAL Planning Officer, MFP
Dr. Allan Johnston, Advisor, MFP
Mr. Samuel Bundotich, Planning Officer, MFP
Dr. Klaus Bethke, Advisor, MFP
Mr. Emery Roe, Advisor, MFP
Dr. S.E. Migot-Adholla, IDS, University of Nairobi
Mr. Tom Downing, ETMA Project, Clark University
Ms. Myrtle de Souza, ILCA
Mr. Dwight Walker, USAID/Kenya
Dr. Barbara Grandon, ILCA
Dr. Richard Hogg, Consultant, World Bank
Ms. Louise Sperling, IDS, University of Nairobi
Mr. Michael Jones, Energy Advisor, Ministry of Energy and Regional Development
Dr. James Ellis, South Turkana Ecosystem Project

Baringo District

Mr. Paul Chepkoin, Soil and Water Conservation Officer, Marigat
Mr. Yegon, District Range Officer, Marigat
Mr. Dickson ole Keis, Headmaster, Meisori School
Mr. Ranson Keben, District Range Officer, Taita-Taveta District (from II Chamus Location and home on leave during July)
Dr. Jeffrey Lewis, Programme Coordinator, BPSAAP
Mr. Yattor, Assistant Range Officer, Mogotio
Mr. Micah Ruto, Soil and Water Conservation Field Assistant
Mr. Henry Parsare, Community Development Assistant, Mukutan Location
Mr. John Jakoyo, Agricultural Technical Assistant

Elgeyo-Marakwet District

Mr. Jan Cappon, ASAL Programme Coordinator
Mr. Kimeli, ASAL Programme Officer
Mr. Rotich, District Range Officer
Mr. Mwara, District Water Officer

Kakamega District

Mr. Hudson Bigogo, District Development Officer
Dr. Barry van Gelder, Beijer Institute Fuelwood Programme
Mr. Musa Enyole, Beijer Institute Fuelwood Programme
Mr. Wasike, District Agricultural Officer
Mr. Chiew, Farm Management Officer
Mr. Wandera, District Water Officer
Ms. Frieda Mwandishe, Bukura Agroforestry Center
Mr. Were, Assistant District Agricultural Officer

Siaya District

Mr. Ayieko, Administrator, Siaya Agroforestry Project
Ms. Jael Oneko, Coordinator of Women's Groups, Ministry of Culture and Social Services
Mr. Joseph Langat, Soil and Water Conservation Officer
Mr. David Mshilla, Regional Planner, Lake Basin Development Authority

Isiolo and Embu Districts

Mr. Mturibe, District Development Officer
Mr. Kulou, District Range Officer
Mr. D. Theuri, District Forestry Officer
Mr. Wachira, District Livestock Development Officer
Mr. Bernard Lester, VSO, Ministry of Water Development
Ms. Hanna Holm, Danish Volunteer, Ministry of Culture and Social Affairs
Mr. John Mwinamo, Provincial Planning Officer, Embu
Mr. Tony Moody, ASAL Coordinator, EMI Project
Mr. Nigel Crowe, VSO, Ministry of Water Development, Embu

Machakos District

Mr. Mbate, Planning Officer, MIDP
Mr. Andrew Weis, MIDP
District Water Officer, Machakos
Mr. Albert Thiadeus, Catholic Diocese Water Engineer

Kitui District

Mr. F. Kalikander, Planning Officer, ASAL Project
Mr. Bill Gibbons, ASAL Project
Mr. Robert Fishbein, Agricultural Economist, ASAL Project
Mr. Mugera, District Water Officer

APPENDIX III

APPLICATION FORM

A PRELIMINARY VISIT AND A FEASIBILITY STUDY BY THE WATER ENGINEER

1. This application should be filled up in duplicate and sent to me Water Engineer, Diocese of Machakos, P.O. Box 640, Machakos.

2. The two application forms must be accompanied by a fee of Ksh. 100/= This amount of money is meant to cover miscellaneous expenditure like transport and administrative cost per project. No application will be considered, which is not accompanied by the above fee.

3. The applicant will receive an acknowledgement, a receipt for the fee, and will be informed of the date, on which the water Engineer will visit his or her project.

3. It should be noted, that this application covers only a preliminary visit and a feasibility study. If more visits are required, a detailed survey, design and cost estimate, the applicant might be charged with an extra fee. The latter depends on the type and size of the project, besides the amount of work to be done by the Water Engineer.

NAME OF PROJECT ----------

DIVISION ---------- LOCATION ----------

SUBLOCATION ---------- VILLAGE ----------

The Project is located ---------- km/Miles from -------- (township)

Name of person responsible for the Project ----------

Has the project support from the Local authorities (subchief or chief)

Amount of funds raised ----------

Peoples' contribution at present ----------

Address to which all letters should be sent ----------

DESCRIPTION OF THE PROJECT - Indicate clearly what you propose to do, how many families will be served, which water source etc.

I request that the Water Engineer of the Machakos Diocese visits the above water project and prepare a feasibility report. I enclose a fee of Ksh. 100/=.

PLACE ---------- DATE ---------- SIGNED: ----------

DESIGNATION ----------

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