SOME IMPORTANT POLICY ISSUES IN TANZANIAN AGRICULTURAL DEVELOPMENT

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INTRODUCTION

Tanzania has a land area of 88.6 million hectares of which 39 million (over 40%) is considered potentially useful for crop production under rainfed conditions. Slightly over 6 million hectares currently is in annual and permanent crops combined.[1] Forest and woodland are currently estimated to occupy 31.1 million hectares (35.1%). The population in 1983 is approximately 20 million, growing at 3% per year. Population density is only slightly over one person per two potential cropable hectares and about one person for 0.3 hectares of current permanent and annual area in crops. Crop production makes up by far the major part of the total GDP contribution of agriculture though the livestock herd, mostly bovine, includes about 14 million head of cattle (0.7 head per person).

Yields per hectare in agriculture and per head of livestock are low. Despite the large livestock herd less than 10% of the crop area is animal tilled. Animal and mechanical power together account for only about 15-20% of the tillage leaving 80% or more exclusively tilled by hand, generally with crude tools.[2] Agriculture provides about 80% of the employment, generates over 50% of GDP and accounts for about 85% of the foreign exchange earnings. Despite its great importance, agriculture has received

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[1] National Food Strategy, p. 12.

[2] Tractor numbers declined by 70% from 1971/2 to 1978 according to Ministry of Agriculture figures (from 17,297 to 5,137). Ox plows in 1981 numbered only 172,000. For 2000 the goal is 400,000 ox plows and 6,356 tractors (National Food Strategy, p. 27).

only a small and declining part of the total fixed capital formation (11% in 1966 declining to 3.7% by 1974).[1] Combining monetized and nonmonetized investment would raise that to about 11%.[2]

The area irrigated now totals about 140,000 hectares. Most farms are small (average 2.4 hectares) and undercapitalized (less than 10% have either tractor or animal plows). More than 1.4 million of the total of 2.4 million farms are 1 hectare or less in size.

Current Situation

The current economic situation is generally characterized both by Tanzanian and expatriates as one of crisis proportions. The balance of payments situation is particularly serious with exports relative to imports declining precipitiously due to a combination of worsening terms of trade between principal Tanzanian exports and principal imports, particularly energy and the decline in export volumes for most traditional export commodities. Restrictions placed on import of intermediate goods, spare parts, fuel and other imported requirements have severely depressed industrial output and tended also to retard agricultural growth. Food imports are growing rapidly and now equal about 10% of exports. Largely as a result of import limitations imposed by FX shortages, the transport sector has been declining in its ability to meet needs placed on it.

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[1] National Food Strategy, p. 5.

[2] Loc. cit.

Agricultural production appears to have performed better than most other production sectors despite its relative neglect in terms of both public capital and recurrent budget allocations and lack of imports. Data on actual production, yields and input/output relationships are poor except for a few export crops for which public organizations have an effective trade monopoly or other form of control.

Export crop production generally has declined in recent years with prices generally not keeping pace with inflation or parallel market prices of food crops. In recent years major production declines have been experienced on cashew nuts, pyrethrum, sisal, cardamom (50% or greater decline), cotton and cloves, while coffee stagnated. Tea production continued to increase but the growth rate declined. Local prices of export crops have been depressed relative to internal costs, inflation and competing food crops despite substantial government transfers to individual commodity authorities. These transfers have been required because of the unrealistic exchange rate and generally high costs of operation and inefficiencies of parastatals and commodity authorities.

Food production is stated by government authorities to have grown at a rate more rapid than population, but reliable data to support this belief are lacking. Overall agricultural growth is estimated to have been: 1967-69, 2.1%; 1969-76, 3.8%; 1976-81, 5.0%.

Agriculture's contribution to GNP is estimated to have declined from 42% in 1967 to 39% in 1976, but then increased to 50% by 1981, while industry declined.[1] Agriculture currently provides 75% or more of FX earnings and provides directly or indirectly for about 90% of the employment.[2] These figures are estimates based on very limited data on major crops and much less on minor crops and livestock.

Estimates of areas planted, yields and production vary widely among commodities and data sources. Inferences on year to year changes in food crop production are based largely on procurement, prices and price relationships. In these circumstances diagnosis as to causes of inferred production problems are likely to be, at best, further removed from the realities than information on production.

Current estimates of grain production used in the June 1982 price policy paper are based on the 1977/8 Ministry of Agriculture estimates as follows: sorghum 600,000 MT, millets 300,000 MT, cassava 10,000,000 and beans 200,000 MT and assumed growth rates of sorghum 5-6%, millet 4-5%, cassava 4-6% and beans 14-15%.[3] Similar production estimates were not shown for maize, rice and wheat---only estimates of procurement. Some documents fix maize production, in the 1980's, at about 1.7 million MT, rice about 200,000 MT and wheat around 50,000 MT. Yield estimates vary widely.

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[1] The Tanzanian National Agriculture Policy, Task Force on Agricultural Policy, October, 1982, p. 21.

[2] The Agricultural Policy of Tanzania, Min. of Ag., March 31, 1983, p. 1.

[3] Annex 2, p.6, MDB, December, 1983, p. 43.

The MDB for 1979 estimated maize production at 1,041,000; paddy 220,000; wheat 104,000; sorghum and millet combined at 410,000 and cassava 1,185 MT (dried basis). This would mean about 90 Kg./capita of cereals and 60 Kg. cassava from domestic consumption which would be slightly over 400 grams per day combined (about 1250 calories per day).

The evidence to support the assumption that food crop production is growing at near 6% appears meagre. Rather, evidence seems to suggest that food production is not keeping pace with the population growth rate--e.g. high prices and, since 1978-9, failure to procure at official prices even in normally surplus areas. On June 27, 1983, the Minister of Agriculture, in outlining plans for 1983-2000, said food production had declined for the last four years (1979/80 to 1982/83).

Current information on what farm families consume, what they market, how they market, how the market system functions and prices at different levels are inadequate for proper analysis.[1]

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[1]See Appendix I, Data Problems in Mathematical Analysis of Factors Affecting Production.

RECENT POLICY STUDIES

In the last year or two the Tanzanian agricultural situation and underlying policies have been subjected to intensive scrutiny, discussion and analysis both by Tanzanian political leaders and economists and by international groups. The latter includes IBRD, FAO, IMF and bilateral donors. Further, there are a number of continuing or annual studies bearing on such key matters as agricultural prices and operation of the various commodity boards and parastatals.[1] IBRD, in Sept. 1982, completed a draft of a comprehensive agricultural sector report which discusses in detail the current situation and makes extensive policy and other recommendations for improvement.[2] Particularly significant recent Government of Tanzania reports include Tanzania National Food Strategy, Main Report [3], Tanzania National Agricultural Policy, Interim Report of the Presidential Task Force on National Agriculture Policy[4], Agricultural Policy of Tanzania, prepared

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[1]See, for example, the Price Policy Recommendations for July 1982, Agricultural Price Review, Annexes 1 - 8, prepared by the Market Development Bureau.

[2]Tanzania Agricultural Sector Report, IBRD, Sept. 27, 1982.

[3]Ministry of Agriculture, Dar Es Salaam, June 1982.

[4]Dar Es Salaam, Oct. 1982.

by the Ministry of Agriculture[1] and Structural Adjustment Programme for Tanzania[2]. Individual bilateral donors have demonstrated a substantial interest in the key policy issues and have contributed in varying degrees to the discussions on agricultural development and related policy.

These reports differ somewhat in their respective diagnoses of the problem and recommendations. There are, of course, the usual differences on importance of fundamental factors with the multinational and bilateral donors assigning relatively more responsibility for the current economic stagnation, decline in exports, the FX crisis and food and other consumer goods shortages to the choices made by the Government in organization of production (particularly agriculture and industry) and in marketing, pricing and resource allocation. The Government tends to assign more blame to the unfavorable trade terms of it and similarly situated countries vis-a-vis industrial countries of the north and, by implication, energy exporters who together supply most of her imports, particularly intermediate production goods and energy, and buy most of her exports. All can agree that the present world recession has aggravated the problem for Tanzania and the world.

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[1]March 31, 1983.

[2]Ministry of Planning and Economic Affairs, June, 1982. Particularly Section III, Sectoral Programmes, Agriculture, Industry and Transport, Pp. 15-31.

These differences are inevitable, partly evolving from genuinely held differences in views on the optimal way countries and societies should be organized and how they should relate to each other. It is very unlikey that in the forseeable future the Tanzanian leadership will shift sharply from its socialistic views on organization of production, marketing, economic and social development, but some change seems possible. At the same time, the Western donor group, which includes the U.S. and, in large measure, the multilateral donor organizations (IBRD, IMF and the regional banks) are not likely to be prepared to embrace Tanzania's degreee of economic socialism though they all accept a degree of welfarism and economic socialism. The donor community has a strong intrest in assisting Tanzania to resolve it most pressing balance of payments, FX, budgetary and production problems and to achieve an acceptable rate of growth in total and per capita income.

The immediate need for the donor community and Tanzania is to identify priority areas where they can more effectively employ aid resources within donor and Tanzanian political, economic and philosophical limitations and constraints.

Possible New Direction in Programs and Policies

Each of the major Government of Tanzania policy papers cited above, as well as the National Economic Survival Plan of January, 1982[1] and the 1981/2 - 85/6 draft plan, indicates increased readiness to look hard at internal as well as external economic constraints and problems including those created by the nature of economic organization and operation and to recommend new and innovative solutions. For example, the NESP noted that indigenous factors aggravated the situation. Among these factors within Tanzanizn control were decline in output and productivity in productive sectors and services even where raw materials were available and weather not particularly adverse. Land resources and labor went unused.[2] The IBRD report of September, 1982 cites some of the responsibility shared by the URT and donors in a) over commitment to new projects without ensuring that existing ones can be maintained, b) lack of coordination among donors which has resulted in projects competing for scarce human and other resources, c) tendancy to focus on design and implementation of individual projects with insufficient attention to whether the overall development strategy pursued by Tanzania was viable.[3] It is further noted in the IBRD report that donors will need to shift large portions of their budgets from project to program assistance.[4] The URT has reached similar conclusions with respect to application of future assistance.

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[1]Ministry of Planning and Economic Affairs.

[2]NESP, P. 2.

[3]Op. cit., P. 5.

[4]Loc. cit.

Clearly, with a large part of Tanzania's development resources coming from donor sources, donors can exert a considerable pressure for better or worse in choice of investment. Whether donors were mainly responsible or responsible at all, the fact is that Tanzania currently has major investments now in operation that provide low or even negative returns. The Tanga fertilizer plant and cashew processing are examples where returns are negative. Cotton ginning, oil processing and sugar processing provide, at best, low returns. Alternatively, small scale village sugar processing could have saved large amounts of foreign exchange spent for machinery, fuel and transport, and could have provided more employment. Small scale village mills would be very competitive with current oil extraction rates at most factories. Despite existing nominally adequate capacity, ginning is a major bottleneck in cotton production.

The Market Development Bureau, in its price studies, provides data on high costs and low levels of operating efficiency of the various parastatals and commodities including the National Milling Corporation (NMC), which has principal responsibility for domestic stable food operations.[1] With few exceptions, costs are high and volume handled low. This is further complicated by the low price at which sembe is sold (Sh. 2.50/Kg. compared with Sh. 2.00/Kg. paid farmers for maize). High costs of NMC operations relative to margins between domestic farm prices paid and consumer prices impose high subsidy costs which must be paid in local currency by the treasury. These subsidy costs to the treasury would be much

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[1]See particularly appendices 1 and 2 which deal with food grains, cassava and beans.

higher were it not for the large part which donor financed foods constitute of total NMC sales. NMC shilling costs of port receipt, processing and handling are generally below the sales price. Thus, disregarding import cost FOB (which is not funded by shillings) the LC returns exceed costs and can be used to offset high costs and losses on domestically produced food operations.[1]

In the Government's present tight budget situation acceptance of donor financed food is a very attractive alternative to local procurement. The promotion of additional local products would involve some additional FX costs for production and handling. It seems quite likely that, in the absence of highly concessional food aid, URT would want to make changes to cut losses on domestic operations and provide more stimulus to domestic food production. However, as long as that particular element of aid funding is available only in that form for those or similar food imports, the URT optimizes its financial situation by accepting the food and providing less input and stimulus to domestic production.

Except for sembe, the policy seems to be one of attempting to cover the average costs of the local and imported product. As a result some anomalies appear to exist in recommended retail

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[1] In 1982/3 it was estimated that costs of production of sembe from local maize would be Sh. 5.39/Kg. and from import maize Sh. 3.92/Kg. even though FOB costs were somewhat overstated. Thus, sembe from domestic maize loses Sh. 2,890/MT when sold at 2.5/Kg. Imported maize sembe would lose 1,420/MT, but disregarding FOB value accounted in FX, the shilling cost per MT would be only 1,900 for a LC net of 600/MT. Domestic wheat flour costs 9,147/MT. and is sold at 5,850/MT. Domestic rice costs 44% more than high cost Japanese rice even when the latter includes full SH. equivalent of the FOB cost. Since imported rice is already milled, strictly internal costs for the imported rice are only about Sh. 1,500/MT. and selling price of 5,350 leaving a shilling net of 3,850/MT. available to cover other domestic operations of NMC.

prices shown below.

	1981/2 (actual)	1982/3
Sembe	2.50	2.50
Maize (whole)	3.35	3.35
Rice	5.35	5.35
Wheat flour	5.65	5.65
Millet	3.15	3.40
Millet flour	4.00	4.40
Sorghum	3.10	3.65
Sorghum flour	4.65	5.60
Cassava	3.15	3.65
Cassava flour	3.95	4.25
Beans	6.20	7.20

Alomost one third of the total maize is sold as maize at a price 34% above milled and refined ground maize sold as sembe. Further, sembe which is considered a preferred product is sold at much below cassava, sorghum, millet and their products.

With few exceptions, nominal procurement prices (in current shillings) have been raised annually for principal food commodities but the value, adjusted for inflation in the cost of living, has declined steadily since about 1976. During the same period sales prices of NMC have also declined rather steadily in real terms, and as of 1982/3 were about half the mid 1970's prices. Few consumers are consistently able to obtain NMC supplied foods and consequently most buy food in traditional markets at higher costs. Further, procurement by NMC has steadily declined as its prices relative to other traditional markets have declined.

A number of significant changes in policies have been suggested in recent URT publications. These include:

Farm Level

Continue the village organizational concepts which include in

each village: The homestead shamba (private plots near the village), block farms (jointly farmed or, at least, planned but divided into individual family plots), communal farms (a single large unit farmed communally with shared returns); Increased provision for larger private commercial farms, with their own marketing and processing and a share in export earnings to be used for productive imports; Greater economic performance requirements imposed on public and parastatal farms which become profitable and independent of subsidies. Joint public/private enterprise is to be encouraged including foreign investment.

Private enterprise involved in processing and marketing (e.g., oilseeds) will be encouraged to take up farm production.

Agricultural Marketing

The need to improve agricultural marketing is recognized as urgent. More investment will be needed. National Marketing parastatals will be relieved of their production responsibilities. Cooperative unions will be established as direct village buyers from farmers. They will sell to the boards, etc. and directly to nearby unions. The NMC will a) buy surplus food commodities, b) be the main supplier of selected foods in urban areas, c) be the agent for the strategic reserve, d) be the agent for import or export and e) be the food processor, especially in urban areas.[1] This suggests some increased allowance for private and decentralized marketing. The big problem is that village cooperative unions do not now exist. An important conclusion of the various diagnoses

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[1] The Agricultural Policy of Tanzania, Pp. 22-3.

is that marketing has been subjected to too much abrupt change in the past and in the future, changes must be less sharp and less disrupting.

Prices

Relative prices are recognized as important in determining production of different commodities but generally price is considered less important than adequate infrastructure including supply of inputs (fertilizer, seeds, tools, etc.). Prices will be based on costs of production while recognizing need to encourage certain commodities to meet domestic needs or to capitalize on products with high ratio of FX value to FX cost. Consumption will be directed to foods involving lower FX cost. Consumer subsidies will be minimized.

Inputs and Supplies

Increased efforts will be made to supply inputs and services down to village levels. An entity under the Ministry of Agriculture modelled after TFA will play a major role in wholesaling with retailing at the village level carried out by cooperative unions.[1]

Storage and Processing

Storage and processing will be largely in the hands of parastatals but there will be some decentralization involving

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[1] Indonesia follows somewhat this model with a large parastatal handling wholesale down to the kabupatan level with retailing performed by cooperatives and private traders. It has been very successful, almost tripling fertilizer use in four or five years and in that time shifting Indonesia from the world's largest rice importer to virtual self sufficiency.

village level storage by the cooperative unions and small scale processing including private processors.

Agricultural Parastatals

Parastatals will be expected to become commercially oriented i.e., self sufficient and independent of Government financing and incentives will be provided for efficient operation and improved accounting imposed.

Research and Extension

Research will become more farmer problem oriented, with on farm trials. More funds will be provided and priority given research in staffing.

The program of dispersal of extension among various commodity "authorities" will be reversed and extension personnel and related functions centralized in the Ministry of Agriculture. In so far as possible each large village and each two small villages will have an extension officer.

Mechanization

Particular attention will be placed on animal traction and on improved supplies of better hand tools.

Framework for Discussion

Two recent developments offer almost unique opportunity for donors and URT to come together in a production review and discussion leading to more effective cooperation and coordination of development efforts. These are:

1. The recognition of the current crises situation in Tanzania seen from the perspective of its BOP, FX reserves, domestic budget, stagnation in GOP, growing import dependency, particularly for basic foods, and decline in principal export commodities.

2. The recent series of reports diagnosing the agricultural situation and recommending important policy and program redirection. Of particular significance is the apparent URT and principal donor agreement that:

a) Donor assistance must be maintained at current levels of about $700 million or more.

b) More coordination is needed in donor support to avoid over taxing of domestic resources.

c) In the past there has been an over commitment for projects with too little provision for support of existing projects and activities.

d) There is need for more attention to the overall financial requirements and environment.[1]

The financial crisis has reached the point where during the

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[1]The similarly severe situation in which a large number of other developing countries find themselves detracts attention from Tanzania but crystallizes attention on this DC problem

current calendar year there must be a major shift in donor supplied resources to permit their much more flexible employment to meet essential, largely intermediate, production goods imports. There may well need to be a complete moratorium on other new projects unless they have very quick and clearly high rates of return and demonstrably very favorable BOP impacts.

The donor community, as a group, should be looking to an intensive discussion this fall with URT looking to orientation of its assistance to fast disbursing program type assistance. The URT, for its part, should begin to identify, plan and prepare to implement feasible program and policy changes which likely will be required to elicit these major redirections in aid from the donor community. Both the URT and donor community need to be sensitized to the urgency of preparing now to move in these new development planning and aid directions. The urgency of the need suggests a target for agreement of conditions for changes in aid directions of not later than the last quarter of calendar year 1983. Some representative of the aid community with substantial permanent staff in Dar es Salaam should take a leadership role in coordinating analysis and discussion with URT on these changes.

Some Program and Policy Issues for Discussion

1. Shift to Program Type Assistance

The key issues, of course, are the willingness of donors to shift to program assistance and what URT is prepared to do to ensure that the program aid resources actually achieve major impacts. In so far as consistent with their laws donors should be urged to authorize unrestricted use of resources for procurement of any goods and services which have priority in Tanzanian development.

Restriction on sources of goods and services should be avoided. Any source restrictions should be coupled with increased flexibility on types of goods or services and avoidance of any requirement for additionality to ensure that Tanzania is not saddled with noncompetitive suppliers in drawing on aid resources. Every effort should be made to translate food aid or other specific commodity aid into unrestricted commodity aid.

2. Agricultural Input Supply and Distribution

The URT food strategy paper proposes targets for food and inputs growth between 1983 and 2000 which would increase fertilizer consumption to 653,000 MT. by 2000 (from 82,000 in 1982). This achievement would go far in achievement of agricultural growth targets set in the strategy and thereby greatly expand exports of traditional export crops and move from import to export of some principal food crops. In cooperation with donors URT need to put together an adequate strategy for achievement of such a target reversing past patterns of year to year stagnation or even decline in fertilizer consumption.

- Adoption of a plan for a vast increase in the fertilizer distribution system including private handling especially at town and village levels.
- A pricing system and price relationships that will insure rapid growth in demand.
- An import policy guaranteed to provide early and ample supplies at all points well in advance of application dates.
- Establishment of a country wide program of soil analysis-fertilizer response correlations and widespread soil testing services for farmers.
- Undertaking of complementary policy actions to provide other inputs

and assure incentive farm prices to farmers.

- Continuing survey and evaluation to insure that additional measures needed to stimulate demand are identified and taken.

As a part of this anaysis, experience of other developing countries which have achieved major breakthroughs in fertilizer and crop production should be examined. Candidates should include Pakistan, Indonesia, India and Brazil.

3. Marketing

The marketing system which should provide the key linkage between farmers and consumers at home and abroad has been identified repeatedly by different analysts as a principal impediment to increase in agricultural production and supply of goods for domestic consumers and export. It is clearly evident that the present system serves neither producer nor consumer well and, further, it incurs high subsidy costs to the treasury. Conventional wisdom to the contrary, evidence in many societies demonstrates that traditional systems composed of large numbers of small traders operating under conditions of free entry are highly competitive and operate on small margins. Further, they offer large amounts of employment and generally require much less imported material and hence impose a smaller foreign exchange cost than large scale marketing systems. These should be high priorities of the URT.

Efforts to replace traditional traders and systems by large scale state owned "parastatal" monopolies has imposed heavy demands on the treasury to finance capital and deficit operations. Despite these heavy public subsidies these parastatals generally are unable to perform their assigned roles effectively or efficiently.

Many countries have established state trading corporations such as NMC to a) Provide stable and assured supplies and stable prices to consumers and b) Provide price guarantees for farmers, buying surpluses from farmers at price levels announced before planting. These public companies commonly have played a greater role in supplying urban areas than rural areas. However, almost without exception they have been operated as an adjunct and complement to a large traditional marketing system operating with full sanction and support of the government. Where steps have been taken to create public monopolies, the public companies have been unable to provide the needed linkage between millions of producing units at one end and millions of consuming units at the other.[1] It has been necessary to revert to traditional systems involving small traders performing assembly and retail functions. Even the major, centrally planned economies (i.e., Eastern Europe, USSR) permit small scale private farming and trading which provides a major part of some essential foods in urban areas.

A modus vivendi for state trading corporations to operate as a complement to traditional systems has evolved in socialist countries and in many developing countries over the last three to four decades. That experience would be well worth careful study by the URT and the donor community assisting Tanzania.

Candidate countries for study should include several Eastern European countries (Yugoslavia, Hungary, Romania and Czechoslovakia)

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[1] Traditional systems continued to operate, though nominally not legal, and harassed by Government officials, because they were essential to farmers and consumers, but their costs were driven up by risks of operating outside the law and measures taken to minimize risks--small shipments, day to day stocking, extra precautions, payoffs to petty officials and others.

and developing countries including Burma which has reconciled its strong socialist philosophy with traditional systems. Other candidates include India (the largest system), Pakistan, Sri Lanka, Bangladesh, Indonesia, Egypt, Tunisia, Morocco and Zimbabwe.

4. Prices and Price Relationships

Official prices of agricultural products have lagged behind the cost of living index over the past six to seven years (since 1975-77). Many products at official prices now have only about 50% of earlier value. Despite high subsidies on fertilizer, official crop/fertilizer price relationships are not particularly attractive to increased use. (See Fertilizer, Appendix III,) The principal criterion in setting prices is the cost of production, but data used are inadequate for such an approach. Comparison of scanty data does suggest that there is some correlation between price ratios and production of different products, but little is available on overall price response or on response to prices in traditional markets. Given the monopoly of parastatals, their prices have been virtually the only price for many export crops, while food crops have two sets of prices. A comparison of official prices for both is not very meaningful in attempting to estimate supply response. And it is supply response that is, or should be, the major concern in price setting; not whether a farmer theoretically will attain a preconceived rate of return to labor (now a major factor examined). URT should be assisted, as needed, with resources (financial and professional) to conduct careful study of prices and their impacts on production decisions for individual commodities and total production.

5. Improvement in Production Statistics

Reliable statistics on crop and livestock products are an essential input for sound economic analysis and economic development planning. The shift from focus on projects to programme type assistance will inevitably involve increased attention on macro indicators of progress. The adequacy of currently collected production data should be reviewed from the perspectives of timeliness, accuracy and area and commodity coverage. The URT with appropriate donor community support should develop and implement appropriate plans for improvement. Experience elsewhere with assignment of statistical functions to village extension agents, as proposed in the March 31, 1983 paper, has generally not been satisfactory.[1]

6. Exchange Rates

The issue of exchange rates is a critical one. They affect more than just "the internal distribution of total real income earned by the nation", as suggested in the March 31, 1983 policy statement.[2] Kept low they make it impossible for agriculture or industry to produce for export without levels of subsidies the government cannot afford. Further, they give the illusion of relatively cheap foreign food which is now largely depended upon by NMC to supply urban areas. These exchange rates make domestic products of agriculture and industry appear excessively expensive and inevitably distort the entire resource allocation system. The exchange rate is already a subject of intensive discussions with IMF and IBRD and probably need not be raised again here though its effects are far reaching.

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[1] Op. cit., P. 22.

[2] Ibid, P. 24.

7. Capital Investment and Capital Output Ratio

Review of investments over the past 10-15 years suggests that relatively little careful, comparative analysis of expected return to capital, employment generation and FX impacts has preceded most investments. A mechanism should be established for insuring better future resource allocation. Major issues in conjunction with the switch from project to programme support will be which sectors and subsectors are to be supported, what intermediate goods and spares to import in what quantities. Rate and timing of returns and timing measured primarily in FX (saved or earned) should be the principal criteria applied.

8. Food Aid

A shift to full and free programme aid implies elimination of food tied aid. However, for some donors this may not be entirely possible without reduction in overall aid levels. If such is the case, food aid should be continued temporarily but with the understanding that some device will be found for fully reflecting the value FOB of that food aid in the development programme changes supported by the overall aid. One way would be an agreement that NMC will deposit the full value (FOB) of the food supplied in a development programme account to be used along with other resources for priority uses in the production and trade sectors.

APPENDIX I

DATA PROBLEMS IN MATHEMATICAL ANALYSIS OF FACTORS AFFECTING PRODUCTION

L.A. Msambichaka and J. Sebaja recently prepared an analysis with a mathematical model to identify and define factors affecting production of different grains and to quantify effects. The conclusions with respect to grain reactions to various variables are summarized as follows:

"Variable	Sorghum and Millet	Wheat	Maize	Rice
Capital	Positive	Negative	Positive	Positive
Labor	Negative	Positive	None	Positive
Fertilizer	--	Peculiar	None	Positive
Weather	Positive	Positive	None	Negative
Land	None	Positive	None	Positive
Prices	Positive	Positive	Positive	Positive "

The lack of some normally expected relationships is not surprising given the data limitations and the low levels of some inputs such as fertilizer and capital. The large part of total capital devoted to irrigation for which rice is a major recipient lends credence to the positive capital/rice relationship. It is surprising however that land and production are not related for either sorghum and millet or maize. The positive capital relationship for these crops appears to have been spurious. The positive price responses found for all four grain groups seem reasonable.

The raw data themselves raise some questions. In their Appendix Table I, total harvested hectares is the sum, year by year of the five crops. However, their Table 2 shows great disparities between the total production of grain, col. 1, and the sum for the five crops. In 1965, 1967, 1969 and in 1971 they are the same and in most earlier years they are close, but in recent years, except for 1973 and 1974, totals are much higher, typically 500,000 to one million tons higher. Appendix 2, which shows grain production per active worker includes a similar anomaly between the total and the sum of crops. The total conveys the impression of a 190% increase in output per worker (from .204 to .58 MT/year) but the sum of individual crops shows a much lower but still respectable 95% increase (from .204 to .398).

This well prepared paper is indicative of the data problem in analysis and planning. What is the explanation of these large disparities? How can they be reconciled in planning and policy analysis? What can be done to improve the data base for analysis, planning and and program and policy monitoring?

Appendix 2: Grain Production Per Active Labor Force in Tanzania Agriculture (in tons)

	Total Grain	Maize	Rice	Wheat	Sorghum & Millet
1961	.204	.105	.022	.001	.076
1962	.216	.108	.024	.004	.072
1963	.284	.164	.042	.006	.074
1964	.218	.129	.027	.006	.055
1965	.195	.112	.019	.005	.059
1966	.354	.247	.031	.009	.065
1967	.212	.118	.025	.007	.063
1968	.243	.140	.029	.009	.072
1969	.195	.108	.030	.008	.049
1970	.248	.128	.037	.012	.074
1971	.202	.105	.037	.012	.048
1972	.241	.191	.036	.019	.071
1973	.253	.153	.029	.015	.031
1974	.257	.142	.031	.013	.059
1975	.412	.173	.034	.008	.032
1976	.376	.162	031	.010	.089
1977	.472	.172	.035	.011	.065
1978	.485	.182	.045	.010	.131
1979	.580	.155	.034	.011	.198

Source: *Computed from: FAO: Production Yearbooks 1972-1979, Rome 1973-80.*

From: Lucían Msambichaka and Joseph Sembaja.

Appendix 1: Production, Choice Variables, Weather and Prices

Table 1. Harvested Area in 1000 Hectares

	Total Grain Area T^f	Sorghum and Millet T^f_1	Wheat T^f_2	Maize T^f_3	Rice T^f_4
1961	1112	380	8	642	82
1962	1146	340	18	705	83
1963	1648	340	22	1171	115
1964	1324	390	25	833	76
1965	1342	439	23	829	51
1966	1963	402	34	1400	127
1967	1576	309	31	1132	104
1968	1426	250	34	1014	128
1969	1411	237	31	1014	129
1970	1430	215	49	1015	151
1971	1434	215	51	1015	153
1972	1785	260	70	1300	155
1973	1186	497	55	503	131
1974	832	235	27	471	99
1975	1836	550	56	1100	130
1976	2025	535	50	1300	140
1977	2055	550	45	1300	160
1978	2120	570	40	1300	210
1979	2087	570	50	1300	167

Source: *Computed from: Msambichaka, L.A., Food Grain Shortfalls in Tanzania 1961-1981: A Retrospective Assessment, Economic Research Bureau seminar paper, 1981 (unpublished), p. 38.*

FAO: Production Yearbooks 1972-1979, Rome 1973-1980.

From: Lucian Msambichaka and Joseph Sembaja.

Table 2. Production in 1000 Tons

	Total Grain Output Y^f	Sorghum and Millet Y^{f_1}	Wheat Y^{f_2}	Maize Y^{f_3}	Rice Y^{f_4}
1961	868	325	6	448	94
1962	936	310	18	466	104
1963	1251	328	25	723	183
1964	976	246	27	577	120
1965	876	266	23	503	84
1966	1617	296	39	1127	140
1967	986	292	31	549	114
1968	1150	340	44	664	136
1969	944	236	39	525	144
1970	1234	368	61	637	182
1971	1022	245	62	530	185
1972	1241	367	98	984	185
1973	1325	161	80	800	150
1974	1371	314	68	758	163
1975	2236	172	46	941	186
1976	2075	490	58	897	172
1977	2650	366	62	968	194
1978	2770	748	55	1041	260
1979	3373	1151	65	900	200

Source: *Computed from: Msambichaka, L.A., Food Grain Shortfalls in Tanzania 1961-1981: A Retrospective Assessment, p. 13 and 36.*

FAO: Production Yearbooks 1972-1979, Rome 1973-1980.

Ministry of Agriculture: Hali ya utekelezaji wa Mpango wa Tatu wa miaka mitano katika sekta ya mazao ya chakula 1976/77-1980/81 (unpublished).

From: Lucian Msambichaka and Joseph Sembaja

Table 3. Choice Variables and Weather

	Labor (L)[1] * in 1000	Capital (K)[2] in mil. Tsh.	Fertilizer (F)[3] in metric tons	Weather (W)[4] Total rainfall in mm.
1961	4254	--	2723	18372
1962	4329	120	2340	13530
1963	4406	189	3100	17243
1964	4484	194	3900	13163
1965	4489	244	7000	13443
1966	4568	318	8800	12444
1967	4649	293	8700	15356
1968	4731	293	9000	16160
1969	4853	380	11000	11968
1970	4969	452	15000	14495
1971	5057	479	17400	12312
1972	5147	628	16028	15815
1973	5238	657	19937	12407
1974	5331	1094	31144	11717
1975	5429	1150	29670	11463
1976	5525	1296	31747	12445
1977	5617	1376	37424	14952
1978	5715	1670	44082*	16376
1979	5818	3236	--	--

Source: * *Computation of unavailable data was based on compound projection formula: $A = P_0 (1 + r)^t$, A = Projected value, P_0 = Base year, r = Rate of growth, t = Period.*

1/*FAO: Production Yearbooks 1972-1979, Rome 1973-1980.*

2/*Bank of Tanzania: Economic and Operations Report, Dar es Salaam, June 1980.*
United Republic of Tanzania (U.R.T.): Background to the Budget: An Economic Survey 1966-68 and 1968-69, Dar es Salaam.
Msambichaka, L.A., The Role of Public Agricultural Enterprises in Tanzania with reference to state farms. Conference paper on "The Role of Public Enterprises in Development", Nairobi, Kenya, November 4-7, 1980, p. 24.

3/*FAO: Annual Fertilizer Reviews 1965-1977, Rome 1966-1978.*
FAO: Fertilizer Review 1978, Rome 1979.

4/*U.R.T. Quarterly Statistical Bulletins, Vol. XXV and XXIX, No. 1 and 2, December 1974 and 1978, Bureau of Statistics, Dar es Salaam.*
U.R.T. Statistical Abstracts 1962-1973, Bureau of Statistics, Dar es Salaam 1963-1977.

From: Lucian Msambichaka and Joseph Sembaja.

Table 4. Relative Prices

	Food/ Cash	Sorghum-Millet/ Maize	Wheat/ Food	Maize/ Food	Maize/ Cash	Rice/ Food	Rice/ Cotton
	p^f/p^c	p^{f_1}/p^{f_3}	p^{f_2}/p^f	p^{f_3}/p^f	p^{f_3}/p^c	p^{f_4}/p^f	p^{f_4}/p^{ct}
1961	—	.97	1.33	.97	—	1.33	.40
1962	—	1.13	1.24	.90	—	1.29	.42
1963	—	1.23	1.41	.89	—	1.14	.38
1964	—	1.36	1.68	.90	—	.97	.27
1965	.26	1.58	1.68	.67	.21	.97	.31
1966	.32	1.53	.96	.26	.25	.47	.27
1967	.25	1.48	1.77	.70	.21	.94	.29
1968	.24	1.39	1.71	.68	.20	.97	.29
1969	.21	1.36	1.69	.60	.16	1.83	.47
1970	.42	1.69	1.06	.33	.21	1.22	.72
1971	.26	1.70	1.60	.51	.18	1.72	.66
1972	.24	1.15	1.84	.26	.20	1.93	.64
1973	.20	1.67	2.59	.79	.20	1.97	.66
1974	.28	1.10	1.79	.86	.31	1.63	.60
1975	.20	1.07	2.13	2.50	.31	2.27	.67
1976	.39	1.16	1.24	1.05	.32	1.15	.67
1977	.30	1.76	1.47	1.52	.30	1.50	.69
1978	.37	1.76	1.20	.89	.30	1.24	.67
1979	.30	1.30	1.22	1.12	.27	1.42	.70

Source: *Bank of Tanzania: . . . op. cit., June 1980.*

U.R.T.: Economic Survey and Annual Plan, 1970-71, Dar es Salaam, 1970.

Marketing Development Bureau: Price Policy Recommendation for the year 1981-82, Agricultural Price Review, Dar es Salaam, September 1980.

Malima, K.A.: Economics of Cotton Production in Tanzania, Economic Research Bureau (ERB), Paper 70-20.

Chama Cha Mapinduzi: Sera ya Taifa ya Tija Mapato na Bei, Dar es Salaam, no year given but around 1979-80.

From: Lucian Msambichaka and Joseph Sembaja.

Appendix II

Prices and Trade Data, Selected Food Commodities

Prices Procurement, Imports, Distributions by N.M.C.
1970/71-1983/84
(TShs./Kg. and 000 m.t.)

Wheat and Flour

	Prices				Trade (Wheat Equivalent)	NMC	
	Producer		Retail				
	Nom	1982 terms	Nom	1982 terms	Net Imports	Procurement	Sales
1970/71							
1971/72	.57	3.50				57	
1972/73	.57	3.22				47	
1973/74	.57	2.79	1.65	7.70		28	
1974/75	.77	3.06	2.40	9.40		14	60
1975/76	1.00	3.44	3.75	11.60	60	24	59
1976/77	1.20	3.77	3.75	10.90	34	27	74
1977/78	1.25	3.51	3.78	9.70	41	35	86
1978/79	1.25	3.12	3.78	8.70	61	29	93
1979/80	1.35	2.76	3.78	7.70	32	27	55
1980/81	1.65	2.64	5.65	8.90	49	28	42
1981/82	2.20	2.81	5.65	7.10	71	23	58
1982/83	2,50	2.50	5.65	5.70			
1983/84	3.00	2.75					

Nom - Nominal

1982 terms- Value adjusted to 1982 price equivalent

Source: Ministry of Agriculture, Marketing Development Bureau

Prices, Procurement, Imports, Distributions by N.M.C.
1970/71-1983/84
(TShs./Kg. and 000 m.t.)

Paddy and Rice

	Prices				Trade	NMC	
	Producer		Retail		Net Imports	Procurement	Sales
	Nom	1982 terms	Nom	1982 terms			
1970/71							
1971/72	.52	3.19				45	
1972/73	.56	3.16				47	
1973/74	.57	2.79	1.65	7.70		39	
1974/75	.65	2.58	2.00	7.80		15	38
1975/76	1.00	3.44	4.00	12.40	21	12	38
1976/77	1.00	3.14	4.00	11.60	5	15	56
1977/78	1.20	3.37	3.50	9.10	48	35	77
1978/79	1.20	2.99	3.50	8.10	41	34	70
1979/80	1.50	3.07	3.50	7.20	55	30	61
1980/81	1.75	2.80	5.35	8.40	65	13	77
1981/82	2.30	2.94	5.35	6.70	66	15	78
1982/83	3.00	3.00	5.35	5.30			
1983/84	4.00	3.10*					

Nom - Nominal

1982 terms- Value adjusted to 1982 price equivalent

Source: Ministry of Agriculture, Marketing Development Bureau

* Based on 30% inflation.

Prices, Procurement, Imports, Distributions by N.M.C.
1970/71-1983/84
(TShs./Kg. and 000 m.t.)

	Maize and Sembe (Maize Equivalent)						
	Prices				Trade	NMC	
	Producer		Retail		Net Imports	Procurement	Sales
	Nom	1982 terms	Nom	1982 terms			
1970/71						187	
1971/72	.24	1.47				43	
1972/73	.26	1.47				106	
1973/74	.33	1.62	0.80	3.70		74	
1974/75	.55	1.98	1.25	4.90		24	210
1975/76	.80	2.75	1.25	3.90	106	91	137
1976/77	.80	2.52	1.75	5.10	42	128	134
1977/78	.85	2.38	1.75	4.50	34	213	109
1978/79	.85	2.12	1.75	3.60	- 49	220	156
1979/80	1.00	2.04	1.75	3.60	4	161	223
1980/81	1.00	1.60	1.25	2.00	275	102	293
1981/82	1.50	1.92	2.50	3.10	2.32	89	286
1982/83	1.75	1.75	2.50	2.50			
1983/84	2.20	1.65*					

Nom - Nominal

1982 terms- Value adjusted to 1982 price equivalent

Source: Ministry of Agriculture, Marketing Development Bureau

* Estimate based on 30% inflation

Prices, Procurement, Imports, Distributions by N.M.C.
1970/71-1983/84
(TShs./Kg. and 000 m.t.)

Millet, Sorghum and Products

	Prices				Trade	NMC	
	Producer		Retail		Net Imports	Procurement	Sales
	Nom	1982 terms	Nom M/S	1982 terms			
1970/71							
1971/72							
1972/73	.30	1.68			0.3	0.6	
1973/74	.50	2.45			0.1	1.7	
1974/75	.55	2.18			0.3	1.9	
1975/76	.75	2.54			1.1	2.9	
1976/77	.90	2.83			6.4	10.1 (5)**	2.4
1977/78	1.00	2.82			14.4	33.6 (30)**	1.2
1978/79	1.00	2.50			16.5	58.6 (20)**	2.5
1979/80	1.00	2.05			1.3	20.7	24.3
1980/81	1.00	1.60			0.3	20.0	23.4
1981/82	1.00	1.28	2.00/2.0		0.1	10.3	23.1
1982/83	1.60	1.60	3.15/3.1				
1983/84	2.00	1.50*	3.0/3.65				

Nom - Nominal

1982 terms- Value adjusted to 1982 price equivalent

Source: Ministry of Agriculture, Marketing Development Bureau

* Estimate of 30% inflation.

** Sorghum grit imports.

APPENDIX III

NOTES ON FERTILIZER

Consumption

One of the major problems underlying low rates of growth in agriculture is low soil fertility. Research available indicates a high rate of response to the addition of nutrients, especially nitrogen, in most crop areas. Despite this, the level of use of nitrogen and fertilizer in general is very low in comparison even with most other developing countries. Table 1 from the Spurling report, The Supply and Distribution of Fertilizer, shows 1979 use of nutrients per person and per hectore to be much below other countries, and this table overstates current use levels per hectare for Tanzania.

Total consumption of fertilizer in 1962 was only 8,200 MT of product, mostly of low analysis materials. Consumption grew rapidly after 1962, reaching 93,500 MT in 1975, but has stagnated since and remains near that level.[1] Amount of nutrients now consumed is estimated at about 28,000 MT which would be about 4.5 Kg. per hectare of permanent and annual crop area. The break down on use by crops in 1972 was estimated to be as follows: Maize 25%, Tobacco 25%, Cotton 15%, Tea 14% and Coffee 9%. Since then use on cash crops has declined while use on food crops has increased.

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[1]Estimated to be 82,000 in 1982.

Table 1

Consumption of Fertilizers (selected countries)

Total Fertilizer, nitrogenous, phosphate and potassic (expressed in 100 grams of N, P_2O_5 and K_2O

	100 gm nutrients/ha agricultural area				100 gm nutrient/ha arable land and permanent crops				100 gm nutrients/caput			
	1968/71	1973	1976	1979	1969/71	1973	1976	1979	1969/71	1973	1976	1979
Tanzania	4	5	8	7	30	40	61	58	11	14	19	17
Malawi	28	40	65	51	52	72	118	91	24	33	50	35
Zambia	9	11	16	15	71	87	127	117	84	96	129	108
Kenya	78	85	89	63	224	235	237	169	41	41	38	24
Zimbabwe	155	210	166	164	473	631	492	485	209	262	189	163
India	105	141	187	276	114	152	201	296	34	43	53	74
Nigeria	2	3	16	19	3	5	26	33	2	2	12	13
Sudan	6	8	1	7	31	46	65	41	26	36	49	28

Source: FAO Fertilizer Yearbook, Vol. 30, 1980, as reproduced in Spurling report on Tanzania, P. 2.

Table 2

Production, import (finished fertilizer) and distribution of fertilizer 1972-1981

mt

	Domestic Production	Import (grant)	Import (commercial)	Distribution
1972	14,877	n/a	-	52,850
1973	30,295	n/a	-	66,370
1974	58,428	n/a	-	82,570
1975	59,235	6,860	-	93,565
1976	41,593	37,230	-	70,357
1977	35,110	36,500	-	84,817
1978	44,443	41,334	5,000	82,274
1979	45,815	25,216	-	93,704
1980	50,852	59,041	-	107,091
1981	69,031	54,530	2,287	95,711*

Source: TFC

*provisional figure

One of the objectives of fertilizer development programs in general and particularly the National Maize Project (started in 1976) is to increase production and yields by use of improved seed and fertilizer. However, the increase in nutrients since 1962 (with 25% used on maize) (at 15:1) would have produced an increase of only about 45,000 MT of maize or a contribution to the growth rate of about 2,000 MT/year. The Ministry of Agriculture National Food Strategy Report of June 1982 proposes a growth in fertilizer consumption of about 95,000 MT. A total of 450,000 MT of that would be used on four food crops (maize 350,000, paddy 36,000, sugar 39,000 and wheat 24,000). Assuming that the 350,000 MT going on maize is composed of 40% nutrients, of which a little over 50% is nitrogen, the total increase in nitrogen use on maize would be about 70,000 MT. Used under reasonably modern production methods, this should provide an increase in output of 2 to 3 million metric tons of maize. Major increases should be achieved on most other crops which will receive fertilizer.

Fertilizer Supply

At present fertilizer supply comes almost exclusively from two sources; the local TFC plant at Tanga which was started in 1972 mainly for phosphate production but now diversified to produce some TSP and NPK. Total production of the Tanga plant in 1981 was 69,000 MT. In 1980 production was about 50,000 MT (20,000 MT of ammonium sulphate, 12,000 TSP and 20,000 NPK). This Tanga production has been supplemented by grant financed imports with small and infrequent commercial imports (Table 2). Commercial imports were made in only two years between 1972 and 1981.

Spurling, from his data, concludes that in 1980 foreign exchange (FX) cost of just the raw materials and bags used by the Tanga plant was more than the FX cost would have been to import fertilizer. Thus there was a negative value added in FX terms considering only bag and raw material costs. That is excluding capital and other costs with major FX elements.[1] The average ex-factory price was estimated to be T.Shs. 4,000/MT compared with CIF costs of T.Shs. 2000/MT for similar products. Another problem is that the products are weighted to low analysis sulphate of ammonia (40%) which has only 20-21% nutrients, thus internal transport and distribution costs are very high per Kg. of nutrients.

Table 4 shows the trend in fertilizer sales between 1972 and 1981.

In 1981 total nitrogen consumption was about 14,000 MT, with over 60% of that coming from low analysis, high cost sulphate of ammonia, about half of which is imported. This choice relative to other more economic forms of nitrogen imposed a major increased burden on transport and probably involved poor utilization of available FX. Of the NPK mixtures, 6-25-10 probably is a blend of 54% SA, 29% TSP and 17% SOP or MOP, mainly used for tobacco (Table 4).[2] If so, this implies an even larger use of SA in total N. For

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[1]Spurling, A, Supply and Distribution of Fertilizer, May 4, 1982, pp. 2-11.

[2]From Spurling. The 1979-81 data on TSP and DAP should be checked.

Table 3: Fertilizer and crop prices and price relationships (Prices per Kg. of N and P205 and for selected crops)

	50 Kg bag Am Sub	50 Kg bag TSP	N/Kg	P205/Kg	Maize/Kg	N/Maize	P205/Maize
1975	33	46	3.3	2.0	0.80	4.12	2.60
1976	26	40	2.6	1.78	0.80	3.25	2.22
1978	58.75	82.50	5.875	3.67	0.85	6.9	4.3
1981	94.05	105.05	9.405	4.67	1.50	6.3	3.1
*1983	94.05	105.05	9.405	2.20	2.20	4.5	2.1

* Assumes no change in fertilizer price.

	Crop Price/Kg					Price ratio N/crop				
	Wheat	Paddy	Cotton	Millet	Sorghum	Wheat	Paddy	Cotton	Millet	Sorghu
1975	1.00	1.00	2.00	.75	.75	3.3	3.3	1.6	4.4	4.4
1976	1.20	1.00	2.00	.90	.90	2.2	2.6	1.3	2.9	2.9
1978	1.25	1.20	2.40	1.00	1.00	4.7	4.9	2.5	5.9	5.9
1981	2.20	2.30	3.70	1.00	1.00	4.3	2.56	1.6	9.4	9.4
1983	3.00	4.00	6.06	2.00	2.00	3.1	2.7	1.6	4.7	4.7

Table 4: TANZANIA FERTILIZER COMPANY LIMITED

ANNUAL TREND OF FERTILIZER DISTRIBUTION/SALES 1972 - 1981

PRODUCT	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
SA	19,332	28.900	34,065	43,382	33,325	37,166	36,936	36,488	47,769	44,701.40
CAN	4,200	4,115	1,355	6,095	9,710	8,425	9,417	16,998	19,725	7,018.50
ASN	1,155	2,217	2,250	1,000	-	-	-	-	-	-
UREA	1,973	1,995	1,320	3,600	2,632	2,814	2,724	4,173	3,412	2,669.15
NPK 25:5:5	6,454	4,755	4,577	2,182	3,328	4,647	3,397	6,587	6,483	6,097.20
" 20:10:10	1,007	1,488	6,656	2,053	1,685	3,144	2,467	3,087	12	3,406.45
" 15:15:15	-	-	-	-	-	529	2,292	-	-	-
DAP/MAP	808	418	86	-	4,058	1,489	656	133	-	-
TSP	3,217	5,266	14,377	13,325	10,151	12,114	8,442	9,995	13,501	12,406.50
SSP	4,008	3,765	-	-	-	-	-	-	-	-
TOB NPK	9,473	11,533	15,714	21,285	5,103	16,310	15,081	14,133	14,895	8.483.55
SOP/MOP	2,256	1,525	1,990	643	412	977	863	2,110	1,293	1,786.30
OTHERS	-	391	191	-	-	-	-	-	-	-
TOTAL	53,883	66,368	82,581	93,565	70,404	87,615	82,275	93,704	107,090	96,568.65

MARKETING DIVISION, DAR ES SALAAM, 31/3/1982

Table 5: TANZANIA FERTILIZER COMPANY LIMITED

TANGA PRODUCTION: ANNUAL PRODUCTION - TANGA PLANT - PRODUCT WISE

PRODUCT	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
SA	-	4741	15394	17954	18285	15604	16334	24553	19469	24922
TSP	4766	9909	24947	19717	7248	8452	7880	4084	-	14504
DAP	2105	4281	490	-	6551	-	-	-	12313	-
NPK 4:25:18	-	-	10855	14521	-	-	-	-	-	-
4:18:15	-	-	4777	5951	-	-	-	-	-	-
3:27:18										
+4:25:18	6178	8628	1962	-	9478	-	-	-	-	-
6:25:10	-	935	620	1400	-	12830	20267	8232	13943	15235
2:18:15	-	1614	-	-	-	-	-	-	-	-
25:5:5	-	-	-	-	-	-	-	6883	5128	9240
20:10:10	-	-	-	-	-	-	-	2225	-	5130
TOTAL	13049	30108	59048	59543	41562	36886	44481	45897	50853	69031

tobacco, SA has some agronomic advantage over Urea as a form of nitrogen, but for most other crops and uses this would not be the case and the continued use of SA is hard to justify especially with high internal transport cost and distribution problems.

A new plant is under consideration at Kilwa which would produce 1,150 MT/day of NH_3 and use most of that NH_3 to produce 1,725 MT/day of Urea as the final fertilizer product.[1] The plant would be fed by Songo-Songo natural gas estimated to have proven reserves of at least one trillion cu. ft., twice that needed to fuel the plant for 25 years. Most of the Urea would be exported. That sold locally would be billed ex-plant at the FOB price of exports but probably paid for in local currency. The gas used by the plant would initially be charged at US$0.75/1000 cu. ft. later to be raised to $1.00. The plant as planned would produce about 550,000 MT per year of Urea. If 60% of the year 2000 food strategy target for fertilizer of 653,000 MT were nitrogen products and all of that were Urea, there still would be about 160,000 MT of Urea available for export in 2000.

The proposed Kilwa plant might solve one of the problems of fertilizer supply, namely the Government's reluctance to use its own FX to import fertilizer (as indicated by past dependence on local plant output and aid grants, Table 2). The Tanga plant presumably was also to reduce FX requirements but, as noted, instead has increased FX costs above imports of finished products.

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[1]The latest proposal would raise the NH_3 plant to over 1,300 MT/day and ship out some NH_3.

Further, because of its high costs it has created a need for major subsidies. Despite this subsidy (at current exchange rates) fertilizer costs relative to what farmers pay in other countries are very high. In 1981-2 farmers in Tanzania paid about twice as much as US farmers paid per Kg. of nutrients. At an exchange rate of T.Shs. 10 to US $1.00. they paid about $0.95 compared with US farmer costs of $0.47 to $0.57 for a Kg. of nitrogen in dry form, delivered within a few miles of their farms.

Price Relationships

Table 3 shows price relationships between fertilizer nutrients and official prices of selected crops, 1975-83. Three observations may be made.

(1) Price relationships at official prices deteriorated greatly between 1975 and 1981 for most crops.

(2) Official price relationships in 1981 were not sufficiently favorable to make use of fertilizer on crops for sale at official prices sufficiently attractive to stimulate rapid rates of growth in demand.

(3) The price of fertilizer per nutrient Kg. is very high and the price relationships less favorable compared with the US (and most other countries) despite the high subsidy payments, estimated in 1981 to be 60% of costs. This is largely due to high domestic production and distribution costs and inefficiency. Analysis of nitrogen to wheat price relationships in several other developing countries in North Africa and South Asia indicate that

rapid rates of adoption occur only when the cost of a Kg. of nitrogen falls to or well below the sales value of 3 Kg. of wheat. Because of its lower protein level and high nitrogen response, maize can sustain a slightly higher nitrogen to crop price ratio. In the US the nitrogen to maize price ratio is now about 4.0:1 for maize and for wheat about 3.8:1. U.S. farmers can obtain much lower costs by using direct application NH_3.[1] If fertilizer prices are held constant at 1981 prices and crop prices raised again

[1] Currently the US price of wheat is about 12.5 cents/Kg. and for corn about 12 cents/Kg. In some deficit areas prices are considerably higher, e.g. over 14 cents to farmers in the Delmarva poultry area.

Bulk prices of fertilizer in June 1983 in Maryland, US were as follows (in US cents/Kg.):

Blended NPK		Single Product	Product Cost	N	P_2O_5
N	61.6	DAP	26.4	47	39
P_2O_5	46.2	Urea	26.4	57.4	
K_2	28.6	TSP	21.2		46.1
		NH_3	26.5	32.1	

Delivery and field application would add US $4.00 per acre.

Planting time application of DAP would have a ratio of about 3.9 for wheat and 3.9 for corn. Direct application NH_3 would have a ratio of 2.6/Kg of corn or wheat to buy a Kg. of N. More expensive forms of N such as Urea would have a price ratio of about 4.8 for corn and 4.6 for wheat. From the above it can be seen that choices among even the high analysis solid form products such as Urea and DAP will make a difference of 25% or more cost per Kg. of nutrients. Considering production and internal and domestic transport and handling costs, low analysis products such as SSP and sulphate of ammonia are quite likely to cost the economy double that of DAP and three times the cost per Kg. of nutrients in NH_3 directly applied.

in 1983/4, official level prices should become quite attractive to greater nitrogen use for the next year. At current prices in the traditional markets they already appear quite favorable. One problem is supply.

Problems in Expanding Production

Three problems have been identified in expanding fertilizer use.

1. First and foremost is the inadequacy of supply of nutrients in the right form. In the past supplies have been limited by various factors including FX constraints and inefficiency of the Tanga plant.
2. Inadequacy of the distribution system with some regions having no official outlets. (There may be some private dealers who handle small amounts).
   A proper supply and distribution system for Tanzania probably requires 8,000-10,000 retail outlets--enough to make fertilizer available within a few (5-10) km. of every potential farmer-user.
3. Unfavorable official price relationships and inadequate efforts to stimulate traditional marketing of produce and production inputs (small traders and cooperatives) to capitalize on their lower costs.

The Proposed Fertilizer Plant

The proposed Kilwa plant if it proceeds as planned could produce about 575,000 MT per year of Urea. This would meet total nitrogen needs of Tanzania through the year 2000 and probably several years beyond. The 1982 MA National Food Strategy crop output and input targets for the year 2,000 if achieved would

consume the equivalent of almost two-thirds of the estimated annual Kilwa Urea output of 575,000 MT per year. Urea is not equally suited to all crops and all uses. Thus it may be necessary to obtain some alternative form of nitrogen for some uses but this should be small. The new plant as proposed offers some advantages, but also has some disadvantages. The governments overriding consideration in its approval appears to be FX saving on imports and prospects for FX earnings by export of the surplus. The plant will be fueled by natural gas for which there currently is no alternative export market and there are no readily apparent alternative industrial uses with as high export earnings potential. Having a large domestic plant might assure the availability of adequate supplies to satisfy all domestic demand, but that is not necessarily the case as has been demonstrated in some other countries where fertilizer has been exported while local demand went unsatisfied. The main product, Urea, is growing rapidly world wide as an economic source of nitrogen. Since it is much more concentrated (46-0-0) than ammonium sulfate (21-0-0), internal transport cost on that used here would be reduced. Further Urea requires only natural gas as raw material, but then the final product contains no sulfur which is a disadvantage for some crops and some soils. NH_3 transformed into nitric acid can be used (replacing sulfur) to reduce phosphate rock to produce DAP and MAP.

Urea suffers some disadvantage compared with some products such as Diammonium Phosphate (18-46-0) in its lower nutrient content and higher transport and manufacturing cost per unit of nutrients. For many preplanting applications, DAP has the

additional advantage of not requiring blending. Use of nitric acid to reduce phosphate rock should reduce the need to import sulfur for acid. Thus production of DAP or nitro phos (23-23-0) or monammonium phosphate in addition to Urea has advantages where phosphate rock is readily available. DAP is widely accepted in international trade.

A major concern with the planned plant relates to financial viability and rates of return on the gas and Urea. The operating company, KILWAMCO, is to pay only $0.75 -$1.00 per thousand cu. ft. for gas in early years, and somewhat more later. It takes about 42,000 cu.ft. of gas to produce one ton of NH3 transformed into 1.7-1.8 tons of Urea. At gas prices of $5.00/1000 cu. ft. that would be $200/MT of NH3 and at a fuel equivalent price of $1/gal it would cost about $290. At capacity of 380,000 MT of NH3 and 550,000 MT of Urea per year gas and capital costs will be as follows, (total and per ton) in U.S. dollars.

	Total Millions	Per Ton NH3	Per Ton Urea
Capital: $650M at 15%	97.5	256.50	
Amortization at 5%	32.5	85.50	
Capital cost	130	342	
Gas at $1.00/1000 cu. ft.	16	42	
Total	146	382	265
Gas at $5.00/1000 cu. ft.	80	210	
Total cost	210	505	382
Capital at 10% interest gas $5	77.50	467	310
Capital at 10% gas $1	113.50	300	206

The above overstates somewhat Urea costs since at 550,000 MT of Urea there would be about 50,000 MT of NH3 left over for other uses. However, to the above must be added overhead and other variable costs than gas which probably would be $25 per MT of NH3 sold as NH3 or Urea sold as Urea. Thus the minimum costs

FOB plant per MT with capital at only 10% interest amortized over 20 years, $1.00 per 1,000 ton gas and minimal other costs would be $325 for NH3 and $231 for Urea. In 1983 some imports of NH3 into the Mediterranean were reported at near $150/MT C&F. Urea export prices FOB are much below $231.

At capital costs of 15% all from foreign sources amortized over 20 years (5%) and only $10 million per year of other FX costs, the plant will need to export most of its Urea at an average net FOB price of over $250/MT to breakeven on its FX account.

Economic viability of the plant at going rates of return on investment will be heavily dependent on 1) major and near term increases in fuel price which are reflected fairly quickly in NH3 and Urea prices and 2) that there is no real alternative to this use for the natural gas supply.

Tanzania will be competing with the gulf area where gas is being flared off and hence has no cost or value other than cost of recovery, where capital is very cheap and easy to obtain and where some financing for fertilizer exports (sales) is likely to be available.

KILWA Plan Pricing Assumption

Kilwamco pricing assumptions are based on AOCSA projections of a price of NH3 of $285/MT and Urea of $318/MT in 1987, the first year of operation, and $401 for Urea in 1991. A supplement to the ortiginal proposal submitted in February, 1983 includes the following statement with respect to price and feasibility:

> Today's Fertilizer Prices
>
> A pessimistic pricing scenario was analyzed due to the current "softness" in fertilizer prices. Prices in 1987 were assumed to be no better than today's spot price of U.S. $169 per short ton for ammonia and U.S. $173 per short ton for urea. Prices were assumed to rise on average 6% per year (as in the base case). The internal rate of return would still be positive -- 4.2%. Under these assumptions, cash shortfalls would occur in the first seven years but never exceeding the U.S. $50 million stand-by credit facility. This debt would be retired over the next 5 years, with positive cash flow occuring in years 12 thru 15 averaging U.S. $75 million per year.
>
> Conclusion
>
> Based on the above discussion and information in previous sections it is clear that the pricing of the natural gas at minimum levels and TPDC's willingness to rely on its technical partners for all design, construction, facility management, maintenance, training and marketing of the end products are the most sensitive economic elements in determining the success of the project.

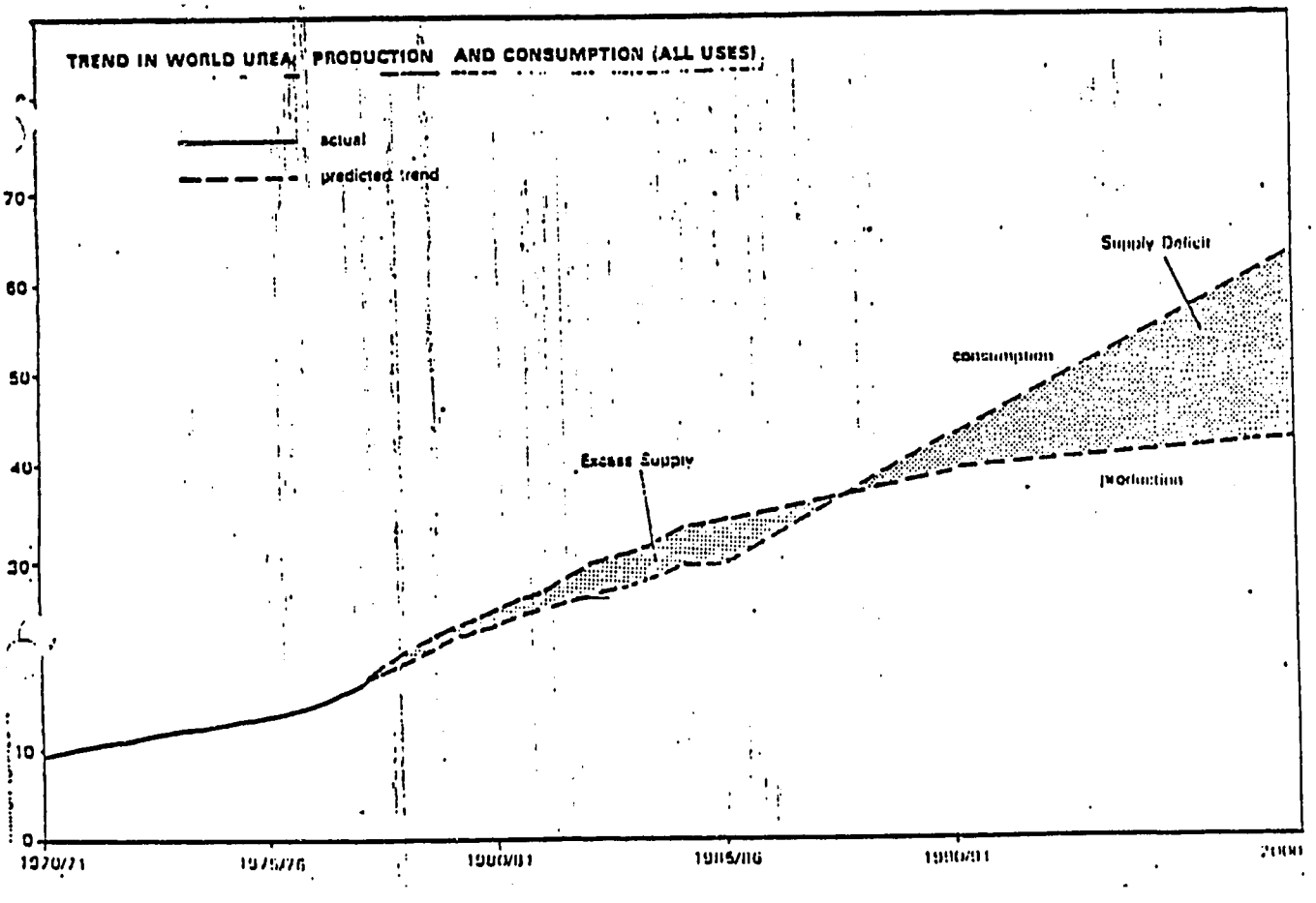
Benefits to Tanzania

The proposal projects penefits to Tanzania in FX to amount to U.S. $1,000 million during the first 10 years when the capital is being paid off and U.S. $1,400 million during the next 5 years (net of shareholder cash flow). It will also provide an indigenous supply of NH3 and Urea for local use payable in local currency. The issue is demand and price that can be expected from export. Assuming that Tanzania will pay the FOB price ex plant for its needs of NH3 for TANGA and for Urea, it should benefit by reduced costs

for its fertilizer needs. One element found in most such fertilizer plant proposals seems to be missing. That is plan for aggressive development of local demand for Urea. This is to be expected since AGRICO does not benefit from higher local sales at the expense of exports. Quite the contrary, AGRICO appears to benefit from a greater proportion being exported.

WORLD SUPPLY/DEMAND BALANCES

British Sulphur's report projected trends in worldwide urea production and consumption which create supply deficits in the latter half of the decade. These overall deficits create a strong demand for urea which will be present during the foreseeable economic life of the project. The chart showing these trends is reproduced here from the Executive Summary of British Sulphur's report.



Source: Kilamco Proposal

6. The financial benefits of the Kilamco project are outlined below:

Total Financial Benefits to Tanzania
in millions of U.S. Dollars

	1987	1988	1992	1996	2001
GASCO Revenues					
- Base gas (a)	13.0	14.0	23.0	28.4	81
- Gas bonus (b)	3.0	25.0	27.0	38.0	57.0
URT Revenues					
- Corporate income tax (c)	--	--	67.0	111.0	154.0
- Housing levy (d)	.2	.2	.3	.4	.5
TPDC Revenues					
- Share of net cash generated from Kilamco (after tax)	7.0	34.0	40.0	61.0	123.0
Total financial benefits to Tanzania	23.2	73.2	157.3	238.8	415.5

(a) Natural gas priced at $.75 per MMBTU in first three years of operation, escalated at 6% in the third year; $1.00 per MMBTU from fourth year of operation until debt is retired, escalated at 6% per year. Thereafter, gas priced at 85% of the average of the previous three years' total gas cost, escalated as above, subject to bonus (b) below in all years.

(b) Natural gas bonus equivalent to one-half of Kilamco's profits after a 25% return on shareholder equity contributions.

(c) Corporate income taxed at 50% of Kilamco's taxable income.

(d) Housing levy at 10% of salaries.

7. The "monetization" of Tanzania's natural gas resources is an important aspect of this project. The effective gas price expected to be realized by the URT based on the financial benefits resulting from Kilamco (calculated in 6 above), are shown in the following table:

Effective Gas Price to Tanzania
in millions of U.S. Dollars

	1987	1988	1992	1996	2001
Total financial benefits to Tanzania	23.2	73.2	157.3	238.8	415.5
MMBTU Gas consumed	16,695	8,853	20,087	20,087	20,087
Effective gas price per MMBTU	$1.39	$3.88	$7.83	$11.89	$20.68