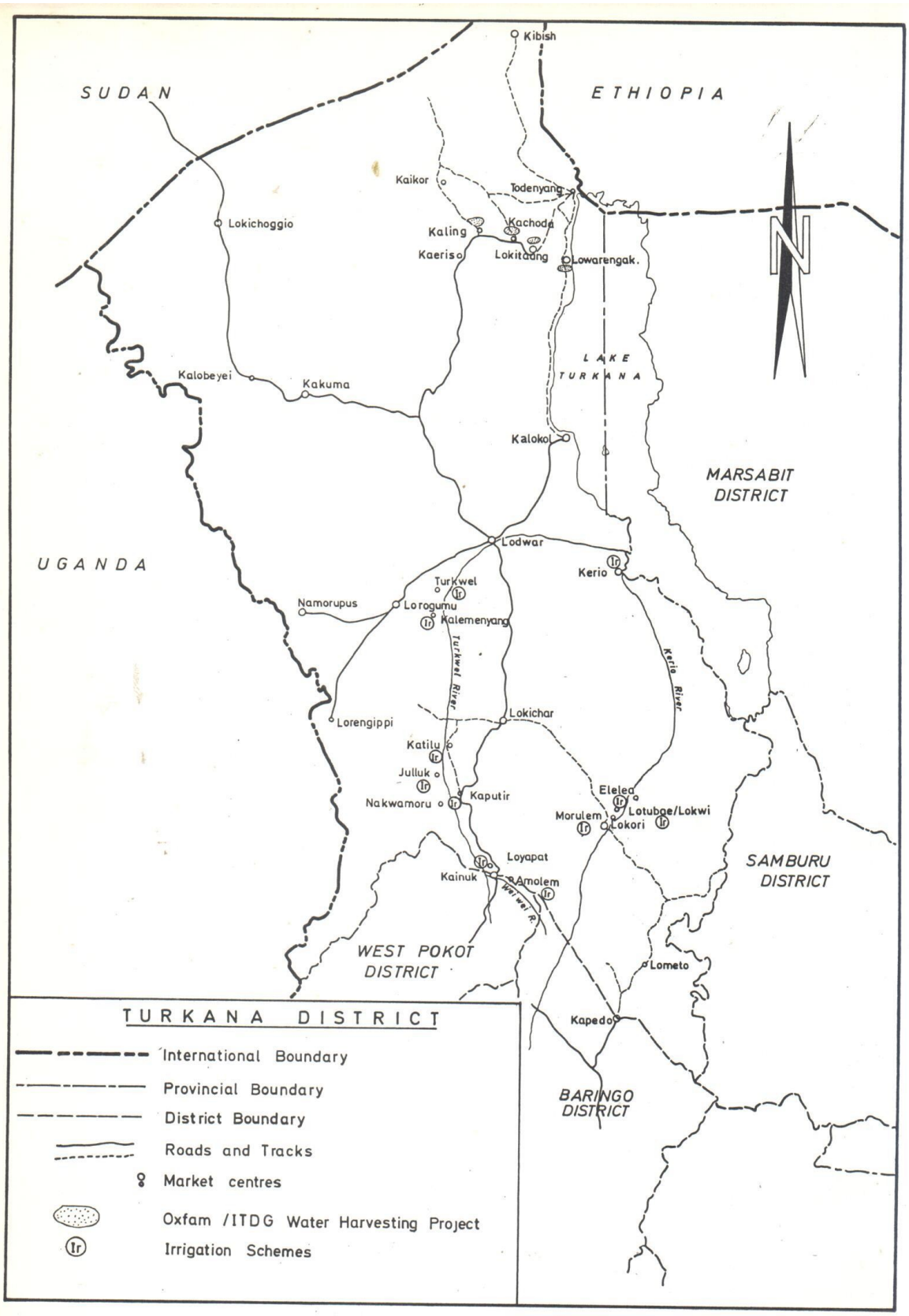
TURKANA RURAL DEVELOPMENT PROGRAMME
(TRDP)

REVIEW OF THE AGRICULTURE AND FORESTRY SECTORS TURKANA DISTRICT

DECEMBER, 1989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Kaputir
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Morulem
Lotubae/Lokwi
Lokori
Loyapat
Kainuk
Amolem
Weiwei R.
SAMBURU
DISTRICT
WEST POKOT
DISTRICT
Lometo
Kapedo
BARINGO
DISTRICT
TURKANA DISTRICT
International Boundary
Provincial Boundary
District Boundary
Roads and Tracks
Market centres
Oxfam /ITDG Water Harvesting Project
Irrigation Schemes

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EXECUTIVE SUMMARY

The project period for review extends from 1986 when the two previous sector reviews were carried out. Because the agriculture and forestry sectors have overlapping interests, this review has examined the two sectors together. The main objectives of the review are:

- to assess the performance of the agriculture and forestry programmes in Turkana District,
- to assess the programmes' impact and strategies in relation to their future viability within the TRDP,
- to make recommendations for changes in objectives and strategies for both the short-term (1990/93) and the long-term (next 10 years).

The Turkana pastoral society is resilient and pastoralism will be the major organizational and production system in both the short- and long-term. Therefore, agricultural, forestry and fishing activities must be in support of the pastoral production system.

Within agricultural production, a greater payoff is likely to come from rainfed than from irrigated cultivation. Rainfed farming should, therefore, be allocated a share of management time and other resources equal to that given to irrigation activities. Given that the distribution, size and potential for rainfed agriculture in the district as a whole is not known, a baseline study should be undertaken before deployment of extension services and logistical support is given to the farmers.

Where irrigation has been established, the management and production systems should increasingly be handled by the farmers' organizations. Water Users Associations or equivalent organizational structures should be strengthened where needed. Co-operatives should be promoted for the development of economic activities but only if they are started with the full participation of the farmers and if its business activities are kept to a level at which the co-operative can manage.

The economics of irrigated production can be improved by introducing suitable crops which require minimum input and which contribute to the local food supply. One such crop is dates, which is already established at Turkwel. Date production should be expanded for use as a cash and food crop. At the same time, more research should be conducted on the date palms to increase the level of knowledge both at the district and national levels. Test trials for other desert crops in the dryland areas should be implemented.

Agricultural and forestry activities can be most efficiently organized by supporting traditional production systems, rather than creating new organizations or land use patterns.

Efforts should be increased on the promotion of agroforestry, particularly in areas used for cultivation.

Natural vegetation will continue to provide most of the wood requirements for the local people and much of the fodder for goats and camels. Forestry resources should be expanded, through preservation and planting, with a focus on the production of fodder and nitrogen-fixing species for traditional farming systems.

A greater local capacity is needed in the district, and to this end, it is important to train Turkanas in pastoral, irrigation, fisheries, forestry and agricultural skills. In addition, the forest, livestock and agriculture departments should have a unified extension programme work in order to minimize staff and operating costs, and to facilitate extension in general.

The fundamental future objective of the agricultural and forestry sectors should be to support and assist pastoral society in order to improve production and conserve the physical environment.

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TURKANA DISTRICT

November 1989

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LIST OF ACRONYMS AND ABBREVIATIONS

AIC	-	African Inland Church
ASAL	-	Arid and Semi Arid Lands
CBS	-	Central Bureau of Statistics
DAO	-	District Agricultural Officer
DDP	-	District Development Plan 1989-1993
DFO	-	District Forestry Officer
EEC	-	European Economic Commission
FAO	-	Food and Agricultural Organization of the United Nations
FFW	-	Food-for-Work
GDP	-	Gross Domestic Product
GOK	-	Government of Kenya
HQ	-	Headquarters
IFAD	-	International Fund for Agricultural Development
JICA	-	Japanese International Co-operation Agency
KARI	-	Kenya Agricultural Research Institute
KEFRI	-	Kenya Forestry Research Institute
KVDA	-	Kerio Valley Development Authority
MISEREOR	-	German Catholic Bishops Organizations
MRDSAW	-	Ministry of Reclamation and Development of Arid and Semi Arid Lands and Wasteland, Kenya
MOA	-	Ministry of Agriculture, Kenya
NORAD	-	Norwegian Agency for International Development
NDP	-	National Development Plan 1989-1993
RAES	-	Rural Afforestation and Extension Scheme
RDF	-	Rural Development Fund
RCEA	-	Reformed Church of East Africa
SP	-	Sessional Paper No. 1 of 1986 on Economic Management for Renewed Growth
STAESU	-	South Turkana Agricultural Extension and Support Unit
TAESU	-	Turkana Agricultural Extension and Support Unit
TDDP	-	Turkana District Development Plan
TOR	-	Terms of Reference
TRDP	-	Turkana Rural Development Programme
TREMU	-	Turkana Resource Evaluation and Monitoring Unit
TRP	-	Turkana Rehabilitation Programme
UNDP	-	United Nations Development Programme
WFP	-	World Food Programme
WUA	-	Water Users' Association

CHAPTER 1 - INTRODUCTION

1.1 BACKGROUND

During the 10th Annual Meeting in October 1988 between the Government of Kenya (GOK) and the Norwegian Agency for International Development (NORAD) on the Turkana Rural Development Programme (TRDP), the Norwegian Delegation indicated that Norway would be willing to enter into a new agreement for financial support to the TRDP for another four year period (Ref. Protocol from 10th TRDP Annual Meeting in Naivasha, October 5-6, 1988).

In order to facilitate decision making on the future orientation of the TRDP, the NORAD Delegation to the Annual Review 1989 informed Kenya that reviews of several sectors would be carried out (Ref. Report from the TRDP Annual Programme Review, March 9-10, 1989).

In addition to the health, education and livestock sectors, the agriculture and forestry sectors were selected to be reviewed. The agriculture and forestry sectors under the TRDP were reviewed by two separate teams in 1986 (Ref. Report of the Review Mission of October 1986 on Forestry Development Project 1984/85-1986/87 and Report of the Sectoral Review on Irrigation with reference to Turkana Agricultural Extension and Support Unit Project Proposal 1984-1987). Recognising a need for developing linkages between the two sector programmes, NORAD decided that this review should incorporate both sectors. A team was recruited from the relevant Government institutions, together with persons possessing a good knowledge of the Arid and Semi-Arid areas.

The composition of the team reflects a need within NORAD for a second opinion on how the TRDP is performing within the agriculture and forestry sectors. Therefore, independent consultants were recruited. In order to facilitate participation in the review exercise and the follow-up process on the part of the concerned national institutions, representatives from GOK and NORAD were also appointed. A list of the team members, and the respective institutions from which they have been recruited, is presented in Appendix I.

1.2 GOK POLICY FRAMEWORKS FOR AGRICULTURE AND FORESTRY

National long term development policy is found in 'Sessional Paper (SP) No.1 of 1986 on Economic Management for Renewed Growth.' It is this key policy document which was used to elaborate the current 'National Development Plan 1989-1993' (NDP).

This Sessional Paper was developed after the oil shocks of the seventies, the decline in Kenya's terms of trade, domestic inflation of the early eighties and the devastating national drought of 1984. To date no major review of the national strategy has been undertaken in spite of the current domestic inflation and the continued problems with balance of payments related to the deterioration of the terms of trade in general, and the collapse of the International Coffee Organisation Agreement in particular.

Agriculture

The Sessional Paper, driven by the need to feed the increasing population, set a Gross Domestic Product (GDP) growth target of 5.6% per year for the period 1984 to 2000. Agriculture within the national goal was targeted to grow at the rate of 5% annually, provide food security for about 35 million people by the year 2000, absorb new workers at the rate of 3% yearly with increasing

productivity, supply export crops to get a 150% increase in agricultural export earnings, and finally stimulate off-farm rural activities to facilitate a 3.5%-5.0% annual growth in off-farm jobs (Ref. SP).

According to the current Development Plan, agriculture grew at 3.7%, 4.9% and 3.8% in 1985, 1986 and 1987 respectively. This pattern led to a revision of the growth target for the plan period to 4.6% with the added caveat that it is desirable to achieve a higher rate through "vigorous induction of technical change" (Ref. NDP, pp44). Agricultural policy is prioritized as achievement of internal self-sufficiency, maintenance of strategic reserves and generation of additional export supplies (Ref. NDP).

The strategies identified in the SP to arrive at the agricultural sector targets were improvements on farm practices by adoption of improved varieties, fertilizers and disease and pest control, and research in new varieties and diversification to higher value export crops. For national food self-sufficiency, intensification was recommended for all crops but particular attention was paid to maize for in the words of the SP "white maize is the only one that cannot be secured easily or economically on the world market" (Ref. SP, pp71). Consequently the measures to be adopted are new hybrids, priced to approximate domestic production, consumption and encouragement of on-farm storage (Ref. SP).

Cross referring agriculture to the Arid and Semi Arid Lands (ASAL) section of the SP shows that there was clear recognition of the need to develop specific drought resistant crops and small-scale irrigation to help in guaranteeing food security for districts like Turkana.

By the time the NDP was drafted, the importance of drought resistant crops such as sorghum, millet, potatoes, beans, other legumes and oilseeds, was getting prominence (Ref. NDP). The NDP also recognises that there is repeated food insecurity in the ASAL areas. The strategies for handling these are identified as government assurance of availability of supplies, storage and stabilised producer prices (Ref. NDP).

Forestry

The SP recognises that the strategy for agricultural growth would lead to greater fuel wood demand. The attendant urbanization would lead to greater demand for charcoal, firewood and commercial wood. The three categories of wood energy were thus targeted to grow at 3.0%, 4.7% and 6% annually between 1985 and 2000. The needed expansion was to come out of three programmes for wood energy supply. These are agroforestry, reforestation and fuelwood plantations (Ref. SP).

Fuelwood provides 70% of the energy used in Kenya and 95% of all rural energy needs. There already is a shortage of supply of fuelwood which is expected to grow as follows; 1985 5.4 million tonnes; 1990 9.8 million tonnes; 1995 12.0 million tones and 2000 30.6 million tonnes. Of the 18.7 million tonnes supplied in 1980, 47% was from agroforestry sources, 28% was from gazetted forests and 25% was from rangelands (Ref. NDP).

Since the rangelands are increasingly important as a source of wood energy as they provide about 75% of all urban charcoal and since regeneration of rangelands biomass is more problematic than regeneration in high potential areas, the NDP set the objectives of setting special ASAL afforestation programmes, protection and monitoring of vegetative cover in ASALS, expanding chief's nurseries to ASAL districts (Ref. NDP and Kenya Forestry Subsector Review; World Bank 1988).

Forestry resources are seen at the national level in terms of their provision of energy and not as fodder. In the case of Turkana the more important aspect of forestry resources is their provision of fodder for livestock since, it is argued that the local energy crisis can be met by collecting dead wood. However, to take care of the increasing urban population, it is important to begin planting trees for the supply of the small urban centres and the future population whose energy consumption will need more fuelwood resources as food patterns change.

ASAL Policy

The Government of Kenya has shown commitment to ASAL Development since 1979 when, in attempts to deal with the devastating droughts of the 1970's, it published 'Arid and Semi-Arid Land Development in Kenya: The Framework for Implementation, Programme Planning and Evaluation.' This document set the objectives of ASAL development programmes as:

a. development of human resources,
b. exploitation of productive potential,
c. resource conservation , and
d. integration with the national economy.

Since then these objectives have been incorporated into the programmes in the various districts in an uncoordinated fashion as was concluded by the comprehensive review 'Arid and Semi-Arid Lands (ASAL) Development Programme 1988,' which was commissioned by GOK and financed by the International Fund for Agricultural Development (IFAD) and the United Nations Development Programme (UNDP).

At the policy level, the 1979 objectives have remained as the key ones for the GOK to date. After the IFAD review, a new ministry, the Ministry of Reclamation and Development of Arid and Semi-Arid Lands and Wasteland (MRDASAW) was created in 1989. The immediate rationale for its creation was ASAL policy coordination. Since 1979 the lack of one policy institution whose basic responsibility would be to develop policy on ASALs, has led to fragmented thinking about ASAL development. It is expected that MRDASAW will not only make ASAL policy, but will also coordinate external resources and district-based programmes and evaluate, from a national perspective, the development activities in the ASAL areas of the country.

The GOK has not issued a specific document setting out the policy arena for the new Ministry in detail. Proposals have been made within the government and some intra-ministerial discussions were taking place during the last week of November 1989. It is expected that the key activities by the Ministry in the near term will be to:

a. develop a financing mechanism and procedures for ASAL development;
b. set policies and procedures for coordinating donor and Kenyan personnel within specific district programmes;
c. set national ASAL development strategy including research;
d. coordinate implementation of the programmes.

On-going discussions suggest that the lead sector in the development of ASALs will be livestock. Crop agriculture will play a supportive role to the lead sector. Conservation will get special attention particularly where it is related to water harvesting and will preferably be implemented on a catchment basis.

Capacity in the Ministry has been built up by transferring the ASAL Planning

Section of the Ministry of Planning and National Development to the ministry. The senior levels of the Ministry have been staffed. Discussions with districts and donors are in progress.

Since ASAL programmes were initiated after 1979, there has been a tremendous increase in staff and operations in districts where the needed institutional capacity was often lacking. However two remaining policy issues are the training of staff with the competence to handle ASAL development needs and the training of people from the ASAL districts in keeping with the District Focus Strategy. For example, out of about forty technical agricultural staff in Turkana, less than ten are from the district and they are concentrated at the lowest level. Similarly, there is need to address ASAL institution building from a community perspective for it is those institutions which will be expected to carry the long term burden of development if sustainability is to be assured.

1.3 AIMS AND OBJECTIVES OF THE REVIEW

The scope and objectives of the review are given in the two sets of Terms of Reference (TOR) in Appendix II.

Just as it is not justifiable to separate the agriculture sector from the forestry sector, it is difficult in the Turkana context to keep these two sectors apart from the livestock sector. A review of the latter sector has already been carried out (Ref. Turkana Livestock Review, Phase 1 in November 1988, and Phase 2 in March 1989), so the review team for the agriculture and forestry sectors will restrict itself to making references to the livestock sector review reports. As for research activities, the readers of this report should also refer to the Report of the Turkana Resource Evaluation and Monitoring Unit (TREMU), January 16-19, 1989. Although the NORAD-financed TREMU programme is closely linked to the fields being reviewed by this team, the TREMU activities are outside the scope of work of the review.

The project period for review extends from 1986 when the two previous sector reviews were carried out. The team has, however, felt free to review operations which took place prior to 1986, whenever it was found to be necessary and/or relevant. The team has also reviewed and considered the relevance of and follow-up to the recommendations made by the previous review teams.

1.4 NORAD'S INVOLVEMENT IN TURKANA DISTRICT

The Turkana Briefing Notes (Helland, 1987) give an extensive account of the history of Norwegian development assistance to Kenya.

In brief, NORAD's involvement in Turkana stems back to the mid-sixties through famine relief assistance in response to severe drought in the District.

Throughout the seventies, NORAD had been involved in a couple of development activities, namely the fisheries project and the Turkana road. In the mid-seventies limited support was also given to the irrigation sector, through a study to determine the feasibility of constructing a dam on the Turkwel River, and through support for expansion of irrigated agriculture initiated by the Government of Kenya, the Food and Agricultural Organization of the United Nations (FAO) and the UNDP.

In 1979, the Skjerdal Mission was set the task of reviewing on-going NORAD-supported projects, and the possibilities for expansion. That year three different missions carried out further studies and appraisals of the irrigated agriculture, forestry and health sectors in Turkana District.

In 1980, the KEN-040 agreement was drawn up to cover future activities on rural development in Kenya. This agreement initiated the establishment of the Turkana Rural Development Programme (TRDP) (Ref. Helland, 1987, and Sorbo et al, 1988).

The Irrigated Agriculture Sector

In 1966 Kenya's Ministry of Agriculture (MOA) initiated a pilot irrigation scheme at Kaekorongole or Turkwel, with financial support from the German Catholic Bishops Organizations (MISEREOR) and technical assistance from the FAO. The results indicated potential for irrigated agriculture in Turkana, and a second scheme was started at Katilu in 1970. The Amolem scheme was set up in 1976, again with FAO technical assistance but with funding from NORAD through the UNDP. This marked NORAD's initial support to the irrigation sector in the district. These three schemes were known as the Turkana Irrigation Cluster, and their long-term objectives (as with the other irrigation schemes in the district) were essentially to provide alternative means of income to destitute pastoralists and to improve the food security situation in the district.

The Turkana Irrigation Cluster was under direct FAO management until 1978 when the MOA took over. The FAO retained an advisory capacity. Extensive MOA involvement augmented existing organizational problems in terms of failure to provide timely inputs needed for irrigation and farming, and its total managerial control of schemes which tended to reduce the role of farmers to casual labourers (Ref. Helland, 1987).

The FAO/UNDP project was due to be phased out in 1981. Under the KEN-040 agreement, NORAD was to continue its support to the irrigated sector, and it was then agreed that FAO would continue to provide technical assistance. Thus the FAO/NORAD 'Assistance to Irrigated Agriculture in Turkana/Pokot' was officially initiated in 1982, and concentrated essentially on the Katilu, Kaekorongole and Amolem schemes. The long-term objective of this project was the development of self-reliant communities by establishing cooperatives capable of organizing the production of adequate food supplies and by making social services available. So between 1982 and 1985 activities were geared towards the restructuring of the irrigation management systems of the schemes. The management role of the MOA was reduced, and irrigation systems at Katilu and Amolem were changed form ridge-and-furrow to basin irrigation, hence eliminating the need for mechanical cultivation and significantly reducing the operating costs of the schemes.

When the project terminated in June 1984, it was concluded that the majority of the schemes did not have sufficiently reliable water supplies to allow the irrigated plots to provide the settlers with all their basic needs, and that the disappointing performance of the Katilu Cooperative indicated that the management of schemes through cooperatives was not financially and economically viable.

Although operating costs had been significantly reduced, little improvement had been made in the actual performance of the schemes. In order to resolve the continual technical, managerial and operational constraints, and to facilitate the transfer of increasing responsibility of scheme management to farmers' organizations, the South Turkana Agricultural Extension and Support Unit (STAESU) was established in 1983 under the District Agricultural Office (DAO) through NORAD funding under the TRDP. FAO was to provide technical assistance for a period of two years within the areas of farmers' organizations, water management and extension/agronomy.

The Forestry Sector

The 1979 Skjerdal Report had selected forestry as being one of the sectors in need of a thorough review. Up until then the Rural Afforestation and Extension Scheme (RAES) under the Forest Department had restricted activities to the production of seedlings in nurseries, and was under severe financial and operational constraints. The forestry section of the 1979-83 District Development Plan gave high priority to the conservation of water catchments. Regular Forest Department operations were envisaged within the gazetted catchment areas to make Turkana District self-sufficient in timber, fuelwood and building poles. The District Plan also mentioned the regeneration of doum palms along the Lake shore and control of charcoal burning which would encourage the Forest Department to establish new plantations.

The Skjerdal Mission, and the Forestry Sector Appraisal Mission which followed, recommended an approach through demonstration and education. It underlined the need to improve on the knowledge of suitable species, to provide incentives for local participation, and to create an institutional framework as a basis for tree planting and resource conservation in the district.

In 1981 NORAD began to fund forestry programme activities which were supported in the Appraisal Mission report, but only after NORAD-supported technical assistance staff were recruited. The Appraisal Mission had recommended a separate project to implement its proposals, such that the project was clearly distinguishable from the Forest Department. Funding, however, was channeled through the Forest Department, and consequently implementation of the project was slow.

In 1984, the forestry programme was revised whereby NORAD-funded activities were absorbed into the Forest Department budget and the Turkana District Workplan. A number of operational constraints were thus ironed out. The programme is now coming to the close of its final three-year cycle.

In 1986, as a result of the 1985 Review Mission, the NORAD forestry sector programme began to fund the Kenya Forestry Research Institute (KEFRI) in its research efforts in Turkana District. KEFRI established a small research station in the Forest Department compound. It has now taken over the responsibility for monitoring the browse trials, and for investigating success and growth rates in the nurseries and plantations.

CHAPTER 2 - GENERAL OVERVIEW OF THE DISTRICT

Turkana District is the second largest district in Kenya and encompasses an area of approximately 70,000 sq km (Ref. Turkana District Development Plan 1989-1993 (Ref. DDP). The district, situated in Kenya's north-western corner, shares its north-eastern, northern and western borders with Ethiopia, Sudan and Uganda, and its southern and south-eastern boundaries with the Kenyan districts of West Pokot and Samburu. Lake Turkana forms the eastern boundary of the district (see Map).

The population of the district in the 1979 national population census was estimated at 142,702 individuals (Ref. DDP). The projected population estimate for 1989, which assumes a decline in both fertility and mortality, is 145,397 (Ref: DDP). This downward trend in population size is at variance with a 1984 aerial survey which estimated the population at 250,000; 70% of whom were nomadic pastoralists with the remaining 30% residing in the settlements (Ref. EcoSystems Ltd., 1985). The population is unevenly distributed among the 8 division with 8.7% of the population in Lokori, 18.7% in Katilu, 37.2% in Central and Turkwel, 13.6% in Kakuma and Lokichoggio and 21.8% in Lokitaung and Kibish. The divisions are divided into 29 locations and 51 sub-locations (Ref. DDP).

Table 2.1 - DISTRIBUTION OF ADMINISTRATIVE UNITS, TURKANA DISTRICT

Division	No. Locations	No. Sub-locations
Lokori	6	9
Katilu	4	6
Central	4	5
Turkwel	4	8
Kakuma/Lokichoggio*	5	11
Lokitaung	3	7
Kibish	3	5
Totals	29	51

Source: DDP

* - Lokichoggio was not created as a separate division until after the DDP published.

The district has one urban centre, Lodwar, six market centres and 55 rural centres. Only seven of the centres have an adequate transport link to the provincial headquarters in Lodwar (Ref. DDP). There are a number of air strips, but only the ones at Kalokol, Lodwar and Lokichoggio are tarmacked.

There are 108 primary schools and five secondary schools in the district. The district hospital is in Lodwar, and there are also two sub-district hospitals, eight health centres and 36 dispensaries, 30 of which (one sub-district hospital, six health centres and 22 dispensaries) are operated by the various missions (Ref. TRDP Report of the Turkana District Health Sector Review, 1989). Only the district headquarters, Lodwar, is supplied with electricity. Lodwar and Katilu have telephone communications systems; connections to all the divisional centres is planned (Ref. DDP).

The district is an ASAL area characterized by high ambient temperatures and unpredictable and sporadic rainfall. Mean annual temperatures are around 30° C and vary little throughout the year, with mean annual daily and diurnal

temperature variations of 2° C and 12° C, respectively (Ref. Little and Johnson, 1985). In Lodwar, the district headquarters, located in the centre of the district, precipitation levels average 162 mm per annum with a range of between 19mm and 662 mm (Ref. EcoSystems Ltd, 1985), but rainfall levels vary greatly throughout the district (see Table 2.2 below).

Table 2.2 - LONG-TERM MEDIAN ANNUAL RAINFALL DISTRIBUTION BY AREA

Area	Long-term Medium Annual Rainfall in mm
Katilu	260.7
Lokori	242.9
Lotubae	146.7
Loyapat	575.7
Lorugumu	175.3
Turkwel	152.1
Kalokol	108.7
Lowarengak	160.0
Todenyang	250.7
Lokitaung	311.2
Kaling	210.7
Kakuma	220.3
Lokichoggio	413.7

Source: Compiled from TDCPU 1987 Progress Report and 1988 Annual Report.

The Turkana, who subsist on their mixed-species herds of camels, cattle, sheep, goats and donkeys, supplement their diet with wild fruit and cereals. These items become increasingly important to the household as the dry season progresses and milk yields from the livestock decrease. Many of the pastoralists, especially those who have their 'ere' or wet season grazing areas in localities with stands of trees, have a traditional system of land ownership called 'ekwar' which includes the trees at this site (Ref. Barrow, 1987). All products from these trees - for medicines, food, browse, etc., belong to an individual family. For those pastoral Turkana who have a tradition of sorghum cultivation, the gardens are also located in the 'ere.' The Turkana have traditionally cultivated as part of their subsistence strategy of diversifying resources. A subsistence system based predominantly on agriculture has only occurred among the sedentary Turkana section or 'ekitela,' who reside along the Turkwel river from near Amolem to north of Katilu. The Turkana of this section settled along the Turkwel in the early half of the 19th century when they lost their herds to drought.

Women have traditionally had the management responsibilities for cultivation and therefore the right of ownership through usage of the gardens in much the same way as men have been responsible for the management of the livestock holding. The two activities are not mutually exclusive but rather form a part of the family's strategy for maximization of resources.

As a result of the recurrent droughts over the past 30 years, which greatly reduced livestock holdings, many Turkana have to rely on agriculture to a much greater extent than in the past. Women continue to provide most of the labour input into cultivation, but due to smaller herd sizes and reduced mobility, male members of the household are now assisting to some extent in gardening activities.

CHAPTER 3 - THE NATURAL RESOURCES SITUATION PRESENT AND POTENTIAL

3.1 RAINFED AGRICULTURE

Rainfed cultivation has been practiced in Turkana for many years. The review mission noticed evidence of rainfed agriculture in many parts of the district during the field trip period (Appendix III). The majority of the gardens are found either along riverine areas or adjacent to irrigation schemes. Sorghum is the predominant crop, but cowpeas, maize and squashes are sometimes also grown.

Rainfed agriculture, though widely practiced, has not been given the attention it deserves by the MOA. EcoSystems (1983) observed that rainfed cultivation covered 14% (8,000 ha) of the 571 sq km area between Amolem and the Turkwel Gorge. Currently it is estimated that about 6,000 ha, with an average yield of 500 kg/ha, are under rainfed cultivation (Ref. DDP). Reliable statistics district-wide on areas, locations and yields are, however, not available. Therefore, the potential area under which rainfed agriculture can be practiced has not been accurately determined, although estimates in the order of 3% of the area give an upper limit of 204,000 ha (Ref. DDP). This, then, represents an opportunity for expanding MOA activities.

Rainfed gardens are being expanded by means of water-harvesting and spreading structures. One design is that of trapezoidal bunds which are commonly found along the shores of Lake Turkana and the northern and central parts of the District. Over 120,000 metres of bunds have been constructed in northern and central dry parts of the District (Ref. DDP). The trapezoidal bunds can be maintained by farmers themselves once constructed. In southern Turkana, particularly along riverine forests, rainfed gardens are made by clearing patches of woodland. This has led to deforestation in the vicinity of settlement schemes.

Rainfed agriculture is belatedly being promoted by the GOK and several NGOs. This method of farming involves relatively low capital input as compared to irrigation. Although grain yields have been on the average about 500 kg/ha, it is believed that the yields can be increased to 1000 kg/ha by simply improving species varieties and water-harvesting techniques.

3.2 IRRIGATED AGRICULTURE

About 96% of the district falls under agro-climatic zones 6 and 7 (Ref. Kenya National Soil Survey, 1984). Under these arid conditions, irrigation has been resorted to as a viable strategy for the production of supplementary food.

The only practical sites for irrigation have been on the three major river systems: Turkwel, Wei Wei and Kerio. To date, the total area under irrigation amounts to 882 ha, distributed among 11 schemes; the 12th scheme, Amolem has been abandoned.

Table 3.1 - AREA OF LAND UNDER IRRIGATION AND THE POPULATION OF THE SETTLEMENT SCHEMES

Scheme	River	Sponsor	Area (ha) under irrigation	No.of farmers
Turkwel	Turkwel	MOA/FAO	30	80
Katilu	Turkwel	MOA/FAO	212	650
Nakwamoru	Turkwel	C. Diocese	125	260
Julluk	Turkwel	C. Diocese	80	150
Loyapat	Wei Wei	RCEA	15	40
Morulem	Kerio	AIC	80	950
Elelea	Kerio	TRP	55	650
Lokwi & Lotubae	Kerio	TRP	105	550
Kalemenyang	Turkwel	TRP	80	350
Kerio	Delta	TRP	100	500
Total			882	4180

Source: District Development Plan

A visit to some of the schemes listed in the table above revealed serious problems. A number of the schemes were under-utilised. Initially the different sponsors used heavy machinery to produce crops - a process which did not adequately involve participation by farmers. When the sponsors pulled out, farmers found themselves in the difficult task of manually maintaining canals which were constantly silting up. As the ridge-furrow system was abandoned in favour of the less complex basin irrigation method, yields dropped due to water-logging, shortage of water associated with intake silting and changes in the river courses.

With the above technical, financial and managerial problems, the schemes which were started in order to settle destitutes will probably not be expanded, although the GOK is understandably committed to maintaining them.

The district is estimated to have a potential for irrigation of 20,000 ha ,of which 5,000 ha. are estimated to be due to the increased irrigation potential from the Turkwel Dam. As yet no study has been carried out on the ecological and socio-economical costs and benefits of the dam. It is understood that such an environmental study was proposed before the construction of the dam, but the study is not likely to be undertaken until after construction.

3.3 Livestock

Livestock is the economic backbone of Turkana. This sector has traditionally been the single most important source of food and cash income. It is probable that the sector's role in economic and sociological development will continue to be dominant. Income from sale of livestock in 1987 was estimated at Kshs 21 million while income from crop sales was Kshs 4 million. Hence of the two most important sectors, income from livestock sales accounted for 84% of the estimated total district income (Ref. TRDP, Livestock Review Phase 1 and 2, 1989).

Estimates of livestock numbers in the district vary greatly; a result of various methods of assessment. The aerial surveys have not been followed up by on the ground counts. For the purpose of this review, the livestock population figures from the DDP are employed.

Table 3.2 - LIVESTOCK POPULATION IN TURKANA DISTRICT

Livestock	Number
Cattle	160,000
Goats & Sheep	2,000,000
Camels	100,000
Donkey	70,000

Source: District Development Plan

The Turkana people attach a lot of importance to livestock. The review mission observed that any extra income obtained from the sale of agricultural produce, be it from irrigated or rainfed agriculture, is invested in livestock. It has been argued by some that this commitment to livestock has led to overstocking in some parts of district. This assessment has resulted in a district policy of de-stocking even though a thorough carrying capacity study of the district has not been conducted.

There is potential for livestock production in the district. Most of the Ministry of Livestock Development efforts are geared to quality improvements and better strategies for marketing. There are two schools of thought on the quantity of livestock which can be supported by the district. The argument for de-stocking assumes that the optimum number has been exceeded. On the other hand, it is argued that the district can in fact support more livestock than it currently has. An idea that the district has a potential offtake of 250,000 smallstock per annum has been floated since 1984. This compares unfavourably with 52,557 sheep and goats which were marketed within and outside the district in 1987 by the Livestock Marketing Division.

3.4 Forestry

Vegetation is an important resource in Turkana. Livestock rely heavily on vegetation as a source of fodder in form of browse and pods, particularly during the prolonged dry periods when herbaceous plants are non-existent. In addition, vegetation provides the Turkana with food, fuelwood and building materials.

Although vegetation is of prime importance for the development of the district, it has not been quantified district-wide. The Turkana Resource Evaluation and Monitoring Unit (TREMU) has produced a map of the vegetation resources and land use in Central Turkana, and a technical report is expected in late 1989. The Forest Department has gradually increased its activities on conservation and management of forest resources, in spite of there being no gazetted forests in the district.

The vegetation in the district is conditioned by its arid and semi-arid climate. At higher elevations, woodland vegetation of Acacia species can be found. The summit of the Loima Hills has a tropical mountain forest.

Woodlands are also found along riverine courses of the main rivers such as the Kerio and Turkwel Rivers. Riverine forest accounts for 23% of all woodlands in the district. Acacia tortilis and evergreen tree species such as Dobera glabra and Salvadora persica are also represented in the riverine forests.

Woody species are usually less than three metres high with ground cover of 40% of the areas they occur (Ref. DDP). The eastern and central parts of the

district are drier and characterised by dwarf-shrubs and annual grasses. In these areas woody species are less than one metre high and have a ground coverage of between two and five per cent depending on the location. Along river courses, doum palm are common. Evergreen tree species such as Cordia sinensis, and Cadaba rotundifolia, and Zizyphus mauritania are also common here.

The district has a forestry potential even though it is difficult in the initial stages to establish trees. Research trials show that several tree species, both exotic and indigenous, can be grown without watering provided that adequate water-harvesting and spreading techniques are used. Fencing off degraded areas indicates great potential for regeneration; areas which are normally kept in check by browsing.

CHAPTER 4 - AGRICULTURE

4.1 DESCRIPTION AND ASSESSMENT OF NORAD SUPPORTED ACTIVITIES

4.1.1 Irrigation Scheme Development

Introduction

Irrigation development in South Turkana dates back to 1966 when the Government, with FAO support, initiated an irrigation scheme at Turkwel. Later, other schemes were implemented by the Government and non-government organizations (NGOs) with the aim of settling drought victims. Most of the schemes were characterized by a high incidence of mechanization as well as a low level of farmer participation. However, the small size of individual farm plots coupled with low agricultural productivity could only permit a token irrigation charge which hardly covered the operational cost of the schemes. Hence, it became necessary to maintain a substantial level of subsidy by the government or the NGOs that promoted the irrigation developments. In Katilu for example, the operational cost in 1981/82 was Kshs 14,719/ha compared to an average gross margin of Kshs 4,567/ha (Ref. Working Paper No. 9 Development Planning Division, MOA 1984).

Concerned about the high recurrent expenditure associated with these schemes, the GOK in 1982 requested NORAD and FAO to provide material and technical assistance to schemes located in the southern part of Turkana with the immediate object of reducing the level of mechanization and enhancing farmer participation while at the same time increasing agricultural productivity. The ultimate goal of this support was seen in terms of farmer-managed irrigation systems that were sustainable.

NORAD support was mainly concentrated in Turkwel, Katilu and Amolem although other schemes within southern Turkana were assisted to a lesser extent. A brief description of the schemes and nature of the support they received is given below. A more detailed presentation of scheme features is to be found in TRDP Project Document (1984) and in the FAO/Government Co-operative Programme Terminal Report 1986.

Katilu Irrigation Scheme

Scheme features

The development area consists of a net irrigated area of 211 ha including an eight ha citrus orchard. An intake on the Turkwel river and a six km canal supplies water to 607 smallholder plots, each averaging 0.4 ha.

The main irrigated crops include maize, sorghum and green grams. Cotton was grown as a cash crop up to 1985 when it was stopped because of marketing problems and farmers preference for subsistence crops. In May this year, cotton cultivation was resumed at the farmers insistence and 100 ha has been planted.

NORAD Supported Activities

Through NORAD support, the MOA has executed the following improvements on the scheme:

- construction of additional flood protection works and main drain;
- conversion of an irrigation layout based on furrow/ridge to a basin system;
- resiting of the intake structure;
- installation of additional water control structures.

Assessment of Supported Activities

The incidence of flood damage to canals and irrigation fields was reported to have been appreciably reduced while the new intake structure appears stable. Siltation at the intake and along the main canal is, however, a major problem that requires considerable expenditure of time and effort by the farmers while water abstraction is difficult during low flows.

Although conversion of the field layout into a basin system removed dependency on expensive cultivation machinery, farmers have yet to accept the relatively high labour requirements of the new layout.

Turkwel Irrigation Scheme

Scheme Features

The total developed area is 30 ha which consist of 15 ha of citrus fruits and six ha of date palms. Originally, irrigation water was derived from a storage reservoir which was in turn fed by a canal from the Turkwel River. Both the reservoir and the canal are inoperative as a result of severe siltation. There are 69 'tenant farmers' on the scheme although all of them do not actively cultivate.

NORAD Supported Activities

Although the Turkwel Irrigation Scheme was not included in the STAESU project, it has received some STAESU funds for:

- installation of shallow wells for bucket or hand-pump irrigation;
- employing casual labour for weeding and general maintenance of the date palm and citrus plantations;
- establishment of seedling nurseries (date palms, mangoes, citrus) ;
- promotion of small-scale vegetable production by women

Assessment of Supported Activities

The most notable feature of the rehabilitation exercise is the possible use of shallow wells (2 - 3 metres) as a source of irrigation water. If marketing problems are overcome, vegetable production based on these wells appears

promising. It is interesting to note that in 1979 the scheme had a small vegetable shop at Lodwar, which seems to have collapsed for reasons unknown to the team (Ref. Report on a Joint Kenya Norwegian Appraisal Mission on Further Development of Irrigated Agriculture in the Turkana Area, 1979)

In spite of irrigation water problems, total date production has increased from 890 kg in 1985 to 3200 kg in 1988. This production trend would suggest that there may be a future for date production in Turkana, particularly if efforts are directed towards refining production technology (see Section 4.1.6).

Amolem Irrigation Scheme

Scheme features

This 35 ha scheme draws its irrigation water from the Wei-Wei River by means of an earthen canal. At the time of the review mission, the scheme was virtually deserted as a result problems at the intake as well as heavy siltation along the three km long supply canal. In addition farmers were attracted away from the scheme by alternative employment opportunities at the Turkwel Gorge hydro-power site. A distinguishing feature of the scheme is that the settler community had a mixture of Turkana and Pokot ethnic groups. Apart from 3 ha under citrus, food crops (maize, sorghum, green grams) dominated the cropping pattern.

Following the last review mission's recommendations, the scheme was handed over to West Pokot District in 1988, from where extension support was to be given.

Norad Supported Activities

The funding of the development of the schemes was by NORAD through UNDP.

Design and construction of an intake structure and a gravity canal which replaced the diesel pumps was funded mainly by Food-For-Work (FFW) programme (EEC/Netherlands/WFP) and NORAD.

The conversion of the irrigation layout into a basin system was funded by NORAD.

Installation of additional water control structures was funded by NORAD and the GOK.

Assessment of Supported Activities

The invert level of the canal intake is high in relation to the river water. This has lead to abstraction difficulties during normal or low river flows as well as heavy accumulation of silt both at the intake and at the upper part of the three km supply canal.

At the time of the mission's visit, the scheme was largely abandoned and was quickly reverting to bush.

Other Irrigation Schemes

TRDP through STAESU has been supporting other irrigation schemes such as Nakwamoru, Loyapat and Morulem. At present STAESU is conducting a survey at Julluk with the aim of identifying to what extent technical and material assistance is required.

4.1.2 South Turkana Agricultural Extension and Support Unit (STAESU)

STAESU Objectives

The STAESU project was initiated in 1984 with the aim of giving technical support to the 10 irrigation schemes in South Turkana as well as the adjoining rainfed agricultural areas. In particular, STAESU was expected to achieve the following objectives:

- improved agricultural performance in existing irrigation schemes;
- reduction of recurrent operational costs in the schemes through scaling down of mechanised operations;
- promotion and strengthening of farmers organization;
- expansion and improvement of agricultural production in rainfed areas adjoining the irrigation schemes.

Past NORAD Assistance

NORAD assistance to STAESU has consisted of technical assistance personnel, procurement of vehicles, construction of staff houses at Katilu, limited implementation of rehabilitation works and funding of non-staff operational elements. The salaries of the Water Facilitator and his two assistants are funded through the STAESU budget. The rest of the personnel are employed by the Government of Kenya.

STAESU Organization Structure

In the original proposal document, STAESU was intended to have three sections: an agronomy/extension section, a water resources management section and a mechanical services section.

However, in 1987 the MOA re-organised STAESU in order to conform with the administrative divisions within which irrigation schemes were located. In this regard, extension and other support services were to be administered by the respective Divisional Agricultural Extension Officers-in-Charge of Turkwel, Katilu and Lokori divisions. After this re-organisation, the DAO became the head of STAESU and was responsible for coordinating the work of the STAESU staff as well as the STAESU budget.

At the time of the review mission, STAESU had a total of 30 technical staff who were deployed as shown in Table 4.1.

Table 4.1. - TECHNICAL STAFF AT STAESU

Work Station	Position	Number
Lodwar	DAO/Head of STAESU	1
	Technical Officer (Irrigation)	1
	Dates Officer	1
	Sub-total	3
Turkwel Division	Div Agric Extn Officer	1
	Agricultural Assistant (Dates)	1
	Agricultural Assistant (General)	1
	Agricultural Assistant (Home Ec)	1
	Junior Agricultural Assistant	2
	Sub-Total	6
Katilu Division	Div Agricultural Officer	1
	Technical Officer (irrigation)	1
	Technical Officer (crops)	
	Agricultural Ass (Katilu Irr.Sc)	4
	Agricultural Asst (Loyapat Irr.Sc)	1
	Agricultural Asst(Nakwam.Irr. Sc)	1
	Agricultural Asst.(Julluk Irr.sc)	1
	Agricultural Asst.(Kainuk Rainfed)	1
	Surveyor	1
	Sub-Total	11
Lokori Division	Divisional Agr.Ext.Officer	1
	Technical Officer	1
	Agr.Assistant (Lokwi Irr.Sch)	1
	Agr.Assist.(Morulem Irr.Sch)	1
	Agr.Asst. (Elelea Irr. Sch)	1
	Agricultural Asst.(rainfed)	2
	Sub-Total	7
Mobile	Water Assoc. Facilitator	1
	Water Assoc. Assistants	2
	Sub-Total	3
	GRAND TOTAL	30

Source: Personal Communication, Div. Agric. Ext. Officer Katilu

Performance Assessment of STAESU

STAESU has attained considerable success in a number of areas particularly with regard to reduction of operational cost in Katilu Irrigation Scheme as well the overall operational budget for supporting irrigation activities. During the

1988/89 financial year STAESU was allocated Kshs 2.255 million while the 1989/90 budget provides for Kshs 1.5 million. This is in contrast with 1981-82 budget which amounted to Kshs 3.8 million. (Ref. FAO/Government Co-operative Programme, Project Findings and Recommendations, Assistance to Irrigated Agriculture in Turkana/Pokot, Kenya 1984).

Perhaps the most significant technical success is the conversion of the furrow/ridge system into a basin layout combined with a complete phase-out of mechanised land preparation in Amolem and Katilu. This view is not shared by the scheme settlers, as they made clear to the mission.

Performance in respect of other aspects of STAESU activities may be summarised as follows:

(a) Transfer of Management Responsibility to Irrigation Farmers

Water Users Associations (WUA) have been promoted in Katilu, Loyapat, Julluk and Nakwamoru with varying degrees of success. In Katilu and Loyapat, the WUAs appear to have been effective in organising canal maintenance and distribution of irrigation water. The amount of silt on the 6 Km main canal would, however, suggest the need for affordable technical innovations aimed at easing the drudgery of the desilting exercise. In this connection, use of animal draft power should be explored.

In Julluk and Nakwamoru, the co-operative societies provide the only institutional basis for water management and irrigation channel maintenance. Nakwamoru farmers have resisted adoption of a basin layout, although some 25 ha have been prepared in the scheme by STAESU. They still insist on the mechanised furrow/ridge irrigation system, which in the past has been made possible by a tractor provided by the nearby Catholic Mission. However, during the current season, the tractor experienced regular breakdowns and only 25 of the 280 farmers were reported to be irrigating. None of the 25 farmers are using the basin layout. Most of the other tenants are either engaged in rainfed agriculture or are employed on the Turkwel Gorge Project.

In Morulem and other schemes within Lokori Division, farmers were already well organized at the time of STAESU's inception. This was due to a non-mechanized participatory approach adopted by the African Inland Church (AIC) mission at the time the scheme was initiated in 1979. Hence it has not been necessary to devote much attention to promotion of farmers organisation in this division.

(b) Improvement of Agricultural Productivity in Irrigation Areas

The present crop mix (maize, sorghum, cow peas, green grams, cotton) has largely remained the same in the irrigation schemes for the last twenty years. Recently the commercial growing of okra has been introduced in Katilu, a trend that could provide an additional high value cash crop to the scheme. On the basis of discussions held with the STAESU personnel and the farmers, it would appear that crop yields have remained low. For the most important irrigated crop (i.e sorghum), yields were cited to be in the region of 1-2 tonnes/ha (DAO Katilu, personal communication) compared to a 3.5 tonnes/ha potential (Ref. Working Paper No. 9, Development Planning Division, MOA). Inadequate water supplies due to changes in river courses, canal siltation and intake problems, were partly responsible for the low yields, but a lack of focus on such extension efforts as improved seed, demonstration plots and field visits may also have been a contributing factor.

(c) Promotion of Rainfed Agriculture

Rainfed agriculture has been practiced in parts of Turkana for a long time. However, up-to-date information on the extent, location and types farming systems is not available.

The main focus for rain-dependent cultivation is the riverine flood plains (Kerio, Turkwel and Nei Nei), river deltas (Kerio, Turkwel), along the shores of Lake Turkana, and the northeastern parts of the district (e.g. Oripoi and Tarach areas).

Traditionally, sorghum was the principal crop and 27 local cultivars have been identified (Cullis, personal communication). Rainfall, which can produce floods or heavy run-off, is unreliable. Local communities have responded to these constraints by developing simple water-harvesting techniques combined with selection of short maturing drought tolerant crops. For instance, the traditional sorghum cultivar has a maturity of 62-70 only days.

STAESU was expected to examine the existing rain-dependent agriculture and prepare an appropriate extension package aimed at its improvement. However, since its inception in 1984, STAESU does not appear to have addressed this challenge.

Reasons that have been cited for this neglect include the need to attend to the more serious and immediate problems in the irrigation schemes as well as a lack of personnel with the right skills and orientation for dryland farming. The present district potential for rainfed agriculture has yet to be realized. It is nevertheless gratifying to note that within the STAESU operational area, 2 Agricultural Assistants are presently assigned exclusively to rainfed agriculture at Kainuk and Lokori. Rainfed areas adjacent to irrigation schemes are expected to receive extension coverage from the irrigation personnel.

During the time of the mission's visit, there was considerable evidence suggesting that rainfed agriculture offers a credible option for supplementing food requirements in some parts of Turkana. For instance, near Nakwamoru Irrigation Scheme, there was a good stand of maize which was sustained by a shallow ground water table. Similarly, visit to other sites indicated that recession floods and water-harvesting techniques can support a modest sorghum crop (Kaling and Lowarengak).

(d) Development of Farming Systems

The cropping pattern in the irrigation schemes is characterised by maize/sorghum followed by green grams/cow-peas. As mentioned earlier, renewed interest in cotton on the part of the farmers has resulted in about 100 ha being planted in May this year. Given the recent restructuring of the Cotton Board coupled with installation of a ginnery at Salawa in the Kerio Valley, it is likely that cotton production will stabilize in Katilu and possibly in other irrigation schemes. Nevertheless, there seems to be need for evolving cropping systems that will address the farmers' multiple objectives and needs. Such cropping systems should include grains, pulses, fodder and agroforestry crops.

In the rainfed agricultural areas along the riverine flood plains, little progress has been made regarding:

- documentation, collection and field testing of local crop varieties (sorghum, cow peas, green grams);
- identification of traditional ownership and land usage rights patterns;

- evaluation of local and improved water-harvesting and spreading techniques;

- design of appropriate technical packages and delivery methods for the rainfed areas.

(e) Draught Power Unit

As part of the project component, STAESU was expected to train draught animals and farmers with a view to facilitating land cultivation and on-farm transport. Such training did not start until the first quarter of 1989 when a local person, who had gained ox-ploughing experience in Bungoma, was recruited. So far, four farmers have been given ploughing skills while two oxen have been trained to plough and five donkeys have been trained to pull carts (Divisional Agricultural Extension Officer, Katilu, personal communication).

In Katilu, 20 ha have been ploughed by the two oxen but 10 oxen teams would be necessary for cultivating the whole scheme. Competition for the one oxen team was reported to be fairly high thus suggesting a need for deploying more resources and efforts towards training more oxen teams.

(f) Farmers Organization Development

Co-operatives

The performance level of the co-operative societies on the irrigation schemes has been mixed. In Katilu for instance, the Co-operative Society has declined for two reasons:

(i) inadequate support from the Ministry of Co-operative Development particularly with regard to training and supervisory follow-up;

(ii) high overheads, financial mismanagement and commission deductions resulting in low farmer payout.

Farmers have consequently been reluctant to market through the co-operative and at times have even stopped growing those crops (eg. cotton) which must be marketed through co-operatives.

At the time of the mission's visit, the Katilu Co-operative Society was reported to be operating a pick-up and posho mill, and was ready to purchase cotton from the farmers. To this end, the society had just received a consignment of empty gunny bags from the Cotton Board. Coincidentally, the Chairman and the Managing Director of the Cotton Board were at the same time reported in Lodwar which is an indication of the Board's interest in cotton production within the irrigation schemes. The Cotton Board's interests are, however, in buying dircectly from the farmers (Kioko, personal communication). Other co-operative activities include marketing of sorghum and okra, and the operation of a farm shop.

The society's accounts have not been audited for the last five years and an outstanding debt with the Co-operative Bank amounting to Kshs 236,000/= has not been paid. Furthermore, farmers' meetings take place only once a year, indicating that they have a limited opportunity to acquaint themselves with the society's activities (Agricultural Secretary/Manager, Katilu Co-operative, personal communication).

Water Users Association

This type of farmers organisation is being actively promoted by STAESU in the irrigation schemes. As a single-purpose institution, the WUA is expected to

- evaluation of local and improved water-harvesting and spreading techniques;

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concentrate on issues relating to water management and system maintenance. The composition of the management committee reflects the organizational structure (ie. irrigation blocks) of the scheme.

The WUA has no commercial interests. This is in contrast with the earlier situation when the Co-operative Society in Katilu combined buying and selling of grain, cotton, agro-chemicals as well as managing water distribution and partial maintenance of the irrigation system.

In promoting farmers water associations STAESU has a small section, headed by a WUA Facilitator, which meets with farmers and encourages them to form or strengthen water associations. It is, however, not clear how the water association section fits in with the general extension work of the rest STAESU. Experience from elsewhere in the country indicates that better results are obtained when a farmers' organization facilitator has community development skills that enable him to interact with both the farmers and the technical cadre. Perhaps the most important asset of a community organizer is his/her ability to mix with the farmers. The present situation, where the Water Facilitator projects a high operational-style profile, is inconsistent with an integrative community organizer. Not only is he likely to trigger resentment from other STAESU staff but he will also become less convincing in farmers' eyes.

(g) Women's Groups

There are approximately 25 registered women's groups in Central, Katilu and Lokori divisions located in areas where there are agricultural activities-irrigation or rainfed (Sangnes, personal communication). As a potential target, there are more than 25 women's groups since many are not registered. In the general STAESU operational area, seven women's groups have been targeted by the programme: two in Katilu, one in Turkwel, and four in the Lokori/-Morulem area. The targeted areas match the distribution of the MOA's distribution of female extension officers (agricultural assistants) trained in home economics - one in Katilu, one in Turkwel, one in Lokori and one in Lodwar.

These women's groups are utilizing land on the schemes to grow vegetables. The extension officers assist the groups with technical advice and some materials (e.g. seeds and pesticides). While it appears that the extension officers are committed to their work, the groups do not seem to have `taken off' in terms of crop production. Members seem to become disappointed by lack of markets, water-logging, pests, etc. However, it appears that those women's groups whose members are cultivating individual plots within the communal garden are doing better than those groups where the members all work together on the same land.

In the Katilu irrigation scheme, there are two blocks, B1 and C1, which were originally set up as women only units. The women in Block B1, because of their advanced ages, were given an orchard where they could also grow vegetables. It was apparent to the team during our visit that the orchard had been given very little attention. To a certain extent this may be explained by the women's ages, however it is no longer the case that all members of this block are old or women, since daughters and sons have inherited membership rights. In fact, the elected leader of Block B1 is currently a man.

Women's groups, like schools, are appropriate mechanisms for extension activities, yet only a small percentage of the groups have been targeted. **The STAESU programme should extend their activities to include as many women's groups as possible. Forums will give the opportunity to a group to know who the extension workers are and what they can offer, even if at that point in time they are not engaged in any agricultural activities.**

4.1.3 Turkana Irrigation Cluster and Inherent Problems

In the early seventies, irrigation was perceived as a viable solution to the problem of destitute Turkanas whose livestock had been decimated by drought. Generous donor finances facilitated the establishment of highly mechanized and centralized irrigation schemes on which ex-nomadic pastoralists were settled.

Essentially, these schemes were an emergency response to a drought situation and not part of a larger water and land resources management plan. Consequently little consideration was given to such important aspects as river hydrology and farmers' organizations. The hydrological behaviour of the three rivers (Turkwel, Kerio, Wei-Wei) is particularly crucial for determining the viability of both the present and planned irrigation schemes. The nature of the river systems was seen by the mission during the field visits where it was noted that, with the exception of Morulem, all schemes had problems relating to:

- changes in the river's course,
- heavy siltation of the intake and main canal, and
- destruction of water intake, canal or irrigation field by flash floods.

The seemingly intractable difficulties that have historically plagued the irrigation schemes in South Turkana, have led to considerable disenchantment with irrigated agriculture. This may explain why the TRDP agricultural budget was reduced from Kshs 2,250,000/= in 1988/89 to Kshs 1,592,000/= in 1989/90 (Ref. TRDP Plan of Operation 1989/90 - 1992/93).

The Case for Continued Support to Existing Irrigation Schemes

In spite of the problems that currently attend the Turkana irrigation schemes, there is a need for continued support based on the following reasons:

(a) Existing irrigation schemes represent an important district asset upon which about 15,000 people depend either directly or indirectly. Indeed, it is with a view to safeguarding this population that STAESU was initiated as an essential element of TRDP.

(b) The irrigation schemes coincide with main population concentrations. This has facilitated provision of such important social services as education and health to communities located beyond irrigation schemes.

(c) Given the socio-economic situation in the district, there are very few public investments that can demonstrate an immediate and positive cash flow. On the contrary, most of the investments in the district are regarded as infrastructural, whose payoff can only be realised in the long-term.

(d) Water is a critical resource in Turkana and should be harnessed whenever an opportunity arises for agriculture.

(e) For many years to come, livestock will provide the main inputs to the Turkana economy. In the past, irrigated agriculture was a reaction to negative developments within the livestock sector. However, future improvement of this sector, coupled with general expansion of social services (schools, hospitals, urban centres), will induce demand for agricultural commodities. Thus unlike in the past, positive developments within the livestock sector may be expected to provide a positive response to irrigated as well as rainfed agriculture.

(f) The district's political environment is unlikely to endorse withdrawal of government support for irrigation schemes since they are perceived, in spite of their problems, as symbols of a modern Turkana on par with tarmacked roads, micro-wave telephone relay stations, etc. (Ref. DDP).

The question should therefore not be whether the irrigation schemes should be abandoned but rather how the support can be designed as to be most cost-effective.

However, until the impact of the Turkwel Gorge Dam is fully understood, further irrigation expansion should be discouraged along the Turkwel River. In any case, future irrigation development should be perceived within a broader context as opposed to the piecemeal undertakings of the past. Only such comprehensive planning can address such issues as suitable intake sites, soils types, etc. and the interaction of irrigation with riverine forests, rain-dependent agriculture as well as livestock.

Role of Rainfed Agriculture

In spite of the scarcity and low reliability of rainfall, rainfed agriculture apparently fits in with the opportunistic strategies often pursued by nomadic pastoralists. When rainfall is expected, the pastoralists will sow sorghum with the expectation of a modest yield. If the rains fail, they concentrate their efforts into livestock management.

The MOA could hence seek how it can maximize returns for rainfed farmers by demonstrating better water-harvesting methods, drought resistant seed, use of draught animals, and crop rotation to break pest cycles.

4.1.4 Staff Training

Present Position

At present there are 44 technical staff deployed in the district in various locations (see Section 4.2.4 and Chapter 10).

Agricultural Officers have a BSc in Agriculture, Assistant Agricultural Officers hold a Diploma in Agriculture, and Agricultural Assistants have a Certificate in Agriculture. Junior Agricultural Assistants are recruited locally and have undergone in-service training.

In a comparison of the number of staff to the total area of the district, it is clear that there is a need to increase the technical staff, especially the front line staff, i.e. Agricultural Assistants and Junior Agricultural Assistants.

According to the annual reports, very little staff refresher training has taken place. In 1988, only ten senior staff attended courses within and outside Kenya. The effectiveness of these courses is doubtful since the information is not passed on to front line staff for dissemination.

Training Needs

The following training requirement was put forward by the District Agricultural Officer (DAO):

- One MSc on dryland farming
- Two BSc on dryland farming and agriculture/irrigation engineering

- Two officers for short courses on date palm culture
- Five diploma courses
- Local courses for Agricultural Assistants to be programmed in the district according to need.

It seems necessary to almost double the number of Agricultural Assistants if extension is to be effective, particularly when one considers the number of staff in relation to the number of locations with agricultural potential. This increase in the number of AAs would reduce the distance to be travelled by each officer and reduce the staff:farmer ratio.

Recommendations

The request from the District Agricultural Officer can be considered. There is an urgent need to give the district special clearance to recruit and train Junior Agricultural Assistants from the local community who can speak Turkana.

4.1.5 Possible Orientation of Agricultural Extension Services

Establishment of a Turkana Agricultural Extension and Support Unit

Experience from the last four years of STAESU operation indicates the need for re-stating the objectives of the agricultural extension effort. **In the mission's view, the MOA should provide extension and other technical support to all those areas in the district where either irrigated or rainfed agriculture is practical.**

The objective of such an extension and support effort should include:

- providing technical as well as limited material assistance in maintenance of the intake structures and main canals of irrigation schemes;
- strengthening farmers' organizations in irrigation schemes so that they can manage irrigation water and system maintenance effectively with a minimum of support from the government;
- providing technical assistance to rainfed farmers in the design and construction of water-harvesting structures;
- improving on-farm productivity in irrigated and rainfed farms through better seed, introduction of draft animals and training of farmers (demonstration farms, field days, discussion groups, etc).

A district-wide "Turkana Agricultural Extension and Support Unit" (TAESU) should be established and should formulate work plans that will define achievable targets for the district as well as the sub-district units. In order to achieve the stated objectives, STAESU will have to modify the existing agricultural extension approach with a view to:

- achieving a more balanced allocation of personnel between irrigation and rainfed agriculture;
- retraining extension staff on dry-land farming techniques;
- specifying quantifiable and verifiable targets for the extension staff, which will be the subject of self-appraisal discussions every six months;

- recruiting and placing of Turkana speaking persons as front line extension staff.

Recommendations

(a) TRDP should continue to support the agriculture sector through a broadened and restructured Turkana Agricultural Extension and Support Unit. In this regard, a new project proposal should be formulated for consideration by NORAD.

(b) Concerted efforts should be made to recruit, train and place Turkana speakers as front line extension staff.

(c) For both the irrigation and rainfed agriculture sub-sectors, co-operation and meaningful participation of beneficiaries should be sought. In this regard, the traditional organization structure should be used as a basis for elaborating extension and community mobilization strategies.

(d) Efforts aimed at strengthening farmers organizations (WUAs and Co-operatives) should be seen as part of a wider extension strategy. Consequently, the present functions of the WUA Facilitator should, with immediate effect, be integrated into the district agricultural extension programme.

(e) The TAESU project should institute a monitoring and evaluation mechanism which will pin-point constraints and indicate their timely removal. The monitoring and evaluation report should be the subject of internal self- appraisals to be held annually by the TAESU team.

4.1.6 The Date Palm Project

Background

Dates were first introduced into the Turkwel Irrigation Scheme in 1971 from Pakistan by the FAO team manning the scheme. The aim was to investigate the performance of horticultural and fruit crops under irrigation in the ASAL areas of Turkana. The FAO realized that the only realistic and lasting solution for the people of Turkana is a perennial crop which yields good and reliable returns on labour.

Over 2000 offshoots (suckers) were introduced, some of which were planted in the present orchard, but the majority were planted in a nursery. The varieties introduced consisted of Begum Jango, Assil, Mazewati, Chakri, of which 59 were male date palms. The results seem to have been encouraging because another batch of 5,000 date offshoots was brought from Pakistan in 1974. Twenty-three hundred of these were planted in a nursery at Turkwel; the rest were taken to Katilu Irrigation Scheme to establish a similar orchard.

The 1974 offshoots arrived when the Turkwel Scheme had no water. The date palms were therefore watered with water pumped from shallow wells, while the 4-year old dates introduced in 1971 were not watered at all. Surprisingly, all the old dates survived the drought, and in mid-1975 they flowered. Around this time, the FAO team withdrew from the project and as a result the scheme was more or less abandoned. Date palm planting also ceased. The situation was to remain so for the next 10 years.

In January 1985, the Forest Department, with the assistance of a volunteer seconded by OXFAM and funds from NORAD, decided to rehabilitate the orchard.

At that time, the dates planted in 1971 were still surviving and in good health. The first rehabilitation task was to clean and desucker the plants in the main orchard. The desuckered offshoots from the nursery plots are now used as replanting material for the scarcer varieties in the main orchard while the rest are given to interested farmers to start their own gardens. Some have been sent to other ASAL areas like Garissa, Wajir.

In 1988, the project was handed over to the MOA.

The Present Situation of the Orchard Farm

Presently there are 69 farmers being supported by the project on a 6 ha date palm orchard. The orchard contains 622 mature dates out of which only one-third (or 200) flower annually and produce dates. Irrigation of the date orchard is done manually using ground water wells.

The orchard output has risen from 819 kg of marketed dates at the start of rehabilitation in 1985 to 2300 kg 1988. The marketed output (1988) was valued at Kshs 84,000/= at a market price of Kshs 35/= per kg.

The ownership and management of the projects still lies with the GOK. The present 69 scheme tenants have never participated fully in the project as they consider it to be a GOK enterprise. The MOA hires 11 casual labourers daily to take care of the orchard in terms of weeding, irrigating, desuckering, dethorning, pollination, manuring, harvesting and post-harvest management. For these farm level operations, the project spends a staggering Kshs 180,000/= annually on hired labour alone.

The proceeds from the project (Kshs 84,000/= per year) are transferred to the scheme tenants. No rationale could be established for this since their contribution to the project is virtually nil.

The Assessment of Project Performance

A detailed economic analysis to justify the date project would not possible given the amount of information presently available on the date project. However, the project offers the people of Turkana a possibility to provide for themselves through gainful employment and income generating opportunities.

At present, no other reasonable alternative is in sight but past yields from the mature dates tend to suggest that dates could be a base for the future development of desert crops in most of the ASAL areas in general, and Turkana District in particular.

Operational Constraints of the Project

For the project to be successfully implemented in the district, a number of constraints must be overcome. These include:

(i) Lack of technical and operational data on dates. There is a paucity of the basic agronomic and farm management data on dates at the district level, and possibly at national level. It is not known what the annual gross margins of the project per hectare are, nor what the labour requirements are for possible recommendations on the number of trees that can sustain a household. It is also not known what suitable varieties should be promoted for successful results. Thus no extension packages can be developed. Indeed, even the domestic use of the plant as an alternative food source for the Turkana people has not been promoted.

(ii) The national anchor of the project. The date palm is both a forest and horticultural crop. This raises the fundamental question on which institution should be responsible for the promotion of the various components of the project.

As a forest tree, the mandate to undertake its research and extension is bestowed upon the Ministry of Environment and Natural Resources (MENR), together with KEFRI. As an horticultural crop the mandate for its extension lies with the MOA, while research is in the ambit of KARI. Given that the project is being implemented by the MOA presently, the research and extension components should be handled by KARI and MOA respectively. Herein then lies a problem of co-ordination when two parent ministries are involved in a single project.

(iii) Marketing and post-harvest handling. Although this component of the project is being vigorously pursued, not much is known about its market outlets. The level of domestic and international demand is not known and this should be established before implementation is considered.

(iv) District-wide planting material. If district-wide expansion, and indeed nation-wide expansion, is considered, then the problem of suckers production to meet the district's estimated potential of 5000 ha (which at a 10 x 10 metre spacing will require over 5 million suckers) is enormous.

For the planned expansion of the project, there will be a severe shortage of seedlings unless nurseries are started immediately. But to raise such a high number of seedlings, other sources of multiplication must be sought. The solution lies in employing tissue culture techniques whereby the Department of Crop Science at the University of Nairobi or Moi University and KARI could be contracted to produce the seedlings in their thousands within a very short time. Another feasible solution is the direct importation of clean seedlings (suckers) for the expansion programme.

(v) Community participation in the project. There is an obvious absence of community participation and involvement in the project. Its role has been reduced to that of labour provision as hired hands. The project has not taken into consideration the traditional rights of ownership, and no organizational model on what role community involvement should take is evident. **In the light of this, the mission recommends that the community's role be changed to that of project beneficiaries and ownership immediately.**

In the expanded dates programme, each household could be provided with 20 date seedlings per 0.1 ha, and incentive tree planting could be adopted for at least one year until the seedlings have firmly been established. Shallow wells for the provision of irrigation and domestic water should be constructed such that each well would cater for a minimum of 40 date palms.

NORAD Contribution to the Date Palm Project

Since the start of the rehabilitation of the date project NORAD has been contributing an average of Kshs 300,000/= annually. The funds have been

committed for hired casual labourers, farm-level operations, transport, travelling and accommodation expenses. However, no funds appear to have been allocated for training and extension. The project has insufficient transport facilities and management for effective operation which the NORAD programme could have catered for.

The Future of the Dates Project in Turkana

The Turkana District Development Plan (1989-1993) has projected that about 50 hectares could potentially be put under date cultivation by the end of the Plan period. The Plan notes that over 800 households could derive some permanent benefits from the project which has an expected turn-over of Kshs 400,000/= by 1993. To achieve this will necessitate support from all the concerned parties.

The suitable potential areas for expansion of new seedlings should be:

(a) along the riverine belt 50-100m from the banks of the rivers in Turkana;

(b) in areas with micro-catchments where dates could substitute tree seedlings or be planted side by side in micro-catchments;

(c) in areas where spate irrigation is being undertaken, and

(d) in all settled irrigation schemes.

Thus the possible areas of concentration include Lodwar town, Turkwel, Kalemenyang, Katilu, Nadapal, Amolem, Lokitaung and Lokichoggio.

In this ambitious proposal, shallow wells will be dug at central points for availability of water to supplement the necessary water requirements. A well can serve an average of 100 date palms. The date plants must be owned individually by farmers themselves.

Recommendations

1. **The only realistic and lasting solution to the plight of the Turkana ASAL area is a set of perennial crops which yield good and reliable returns on labour. However, there is a virtual absence of suitable crops which produce secure and economic returns with the limited moisture available in Turkana. The major reason is that little or no research on the breeding of desert crops has been undertaken in Kenya in the past.**

   Presently, date palms are grown in Turkana to produce dates, and although knowledge of its basic agronomy and farm management is hard to come by,in order to pave the way for an economic production of the crop it is recommended that date expansion be immediately expanded as it has potential as an alternative food and cash crop.

2. **Given the important role dates are expected to play in the district for a long time to come, it is recommended that two technical officers (one from KARI, one from MOA) undertake a study tour of 3-6 months in countries, such as Pakistan, Egypt and Tunisia, where date production has had considerable impact on their economy. These officers are to be used as Trainers of project personnel.**

3. Presently, the mandate to undertake research on agricultural and horticultural crops is vested with the Kenya Agricultural Research Institute (KARI). It is recommended that research on the date palms and other desert crops of considerable economic value be instituted immediately by KARI. Trials could start in other ASAL areas with regional research centres such as Garissa, Mtwapa and Katumani. Meanwhile, the Turkana District agricultural team should get support on dates from the KEFRI staff on the ground.

4. Since the MOA is the only institution with a reasonable capacity to undertake agricultural crops extension in Kenya, it is recommended that date palms be integrated into the rest of agricultural extension system in Turkana. This will call for all the Turkana MOA extension staff be involved in date extension from the sub-location to the district headquarters staff. At present only one officer seems to be dealing with date crop extension, and it is essential he has assistance or back-up, particularly if there is a chance that he be transferred elsewhere.

5. Finally, it is recommended that due to the paucity of technical and operational data, including that on established marketing channels, a date volunteer/specialist be provided for the project who will also be involved in the implementation of a national date promotion programme in Kenya. Thus it should immediately be brought to the attention of the Government of the potential and role the date crop is bound to play in the economy of Turkana District in particular, and the Nation as a whole.

4.2 GENERAL ASSESSMENT AND RECOMMENDATIONS ON THE AGRICULTURAL SECTOR MANAGEMENT IN TURKANA DISTRICT

4.2.1 Management

Turkana District has at its disposal tremendous resources in the agricultural sector which demand systematic management. This is possible if the District Agricultural Office has the vision and the managerial power to supervise the necessary activities needed for the implementation of a much broader agricultural programme.

The main managerial issues are to identify and examine whether the available resources within the district have been tapped and harnessed into their most productive uses. The resources of immediate concern in the agricultural sector include the technical capacity to manage the resources, the capital and human investments like transport, office accommodation, water (rainfall) for irrigation, and whether there is a capacity to identify, design and implement an irrigation scheme in Turkana. Others issues are extension, training and the coordination of timely supply of inputs and disposal of outputs.

By far the most crucial and central resource in all ASAL areas, including Turkana, is the availability of water and how efficiently it is applied to solve the needs of the people. Turkana has very little rainfall but many seasonal rivers and luggas which could be harnessed for irrigation.

Thus, over the past 20 years, the agricultural sector has increasingly devoted its district resources to the development of irrigation schemes. Although massive investments have been made in this field over this period, there has been a growing recognition that the various management efforts within irrigated farming have not made their expected impact in the district.

The schemes have suffered from a number of technical and organizational problems. The former include the inability to secure a stable water source and to maintain the various irrigation structures, which in most cases were poorly designed in terms of layout, complexity and sophistication relative to the local management capacities. It is not surprising, then, that most of the schemes have failed to obtain the designed objectives (Amolem, Turkwel). This raises the fundamental issue as to whether the district has the technical capacity to manage irrigation schemes.

Presently, no one in the district agricultural hierarchy has graduate training in Agricultural Engineering with an irrigation background, except the DAO who occupied with administrative tasks. The other 44 technical support staff have experienced no formal training specializing in irrigation engineering, agronomy or extension. The GOK project staffing norm is to have a District Agricultural Engineer with experience in irrigation , implementation, and rainfed agricultural technology. If irrigation is small-scale, relevant and cost-effective, there is potential in the district.

Water-harvesting as a technique requires a more systematic management approach. In most of the schemes, dryland farming or rainfed agriculture activities have expanded to represent a livelihood for residents, which is just as important as the scheme activities. **Due to the past failures of the schemes, it is recommended that rainfed farming (dryland) be allocated as equal a share of management time and other resources as is given to irrigated farming and it should be recognized as a viable alternative to irrigated farming.**

The possibility of intensified land use in Turkana has not received adequate consideration by the agricultural staff. They have been too focused on the irrigated agriculture system. Support to suitable crops, which produce secure and economic returns with the limited moisture available, should be an area of concern for the district managers. It has been recognized worldwide that due to the difficulties in adapting crops suitable to medium and high potential areas to the ASAL areas by way of breeding, a number of research stations have concentrated their efforts on crops which are indigenous to the desert. Some of the available research results indicate that the selection and breeding of native desert crops promise to revolutionize the ASAL areas. Herein lies one of the highest potential resources for the development of Turkana District.

Of immediate concern is the introduction of the following desert crops for trial testing which have had considerable results elsewhere in the world.

Jojoba	-	for production of high quality oil (wax)
dates	-	for the production of food and cash horticultural crops
Guayule	-	for the production of natural rubber
Guar	-	for production of materials use in filters
Euphorbia candelabrum	-	for latex production
Gum arabica	-	for production of wax for preservation of foods
Buffulo gourd	-	for the production of edible oil.

Test trials for the performance of these desert crops are recommended for immediate implementation.

Draught animals are to be found in plenty in Turkana, and could be viewed as a resource to be tapped. They could be used for primary tillage on irrigation schemes, for transport and construction of water-harvesting structures. It is recommended that the animals be introduced immediately in the schemes to ease labour shortage problem.

Farm inputs, eg., fertilizers, seeds and pesticides, is one of the most important agricultural resources that seem to have been forgotten in Turkana. Cropping patterns on the schemes also favour the production of some special horticultural seeds on contract with various seed companies in Kenya.

4.2.2 Community Participation

During the FAO/UNDP period there were substantial efforts made to develop farmer's organizations on the three Turkana Cluster Schemes. However, very little community participation seems to have taken place with regard to the planning and operation of the schemes during that period.

The shifting of responsibility for water management and canal rehabilitation from government to settlers called for more attention and a major revision of the strategy for development of community participation.

The strategy which was chosen, promoted organizations that served as fora for people's participation in decision making and collective work.

It appears from observations and information acquired on the team's field visits to some of the irrigation schemes, that this strategy has been successful. The WUA at Morulem and Katilu and the Kaputir Co-operative at Nakwamoru and Julluk seem to serve reasonably well as a people's forum. They also provide a good forum for dissemination of information and messages from GOK staff. The elected representatives seem to have their members' respect and decisions made in the fora are usually adhered to. Subsequently the team concludes that there has been successful promotion of people's organizations to cater for water management, canal rehabilitation and cropping programme.

The success is, however, limited to non-commercial services. The efficiency of the economic activities of the co-operatives that the team visited (Katilu and Nakwamoru/Julluk) were not impressive, and management capacity to run commercial business is definitely lacking.

A flexible attitude on the part of the GOK/TRDP staff as to which form of organization, (i.e. WUAs or co-operatives) should be promoted, is appreciated. The team supports the idea that it should be left to the people to choose. The experiences of poor financial management in the Katilu Co-operative call for a starting-up period of modest economic activity. The financial management capacity of the co-operative cannot cope with business operations. Water management, canal rehabilitation and crop-planning should become separate functions in order to avoid any adverse effects from a possible collapse of the co-operative. **The team would, however, recommend promotion of co-operatives for the development of economic activities, provided they are started with the full participation of the settlers and its business is kept at a level that is commensurate with the capacity of the co-operative's management.**

Recognizing the necessity of having people's organizations to cater for the essential services connected with irrigation schemes, the team recommends the continuation of promotional work. It appears that WUAs are already fairly well established in two of the schemes, and therefore consideration should be given to the withdrawal of some of the GOK/TRDP WUA support to these particular schemes. By so doing, the capacity for giving more attention to schemes with weaker farmers' organizations could released.

It came to the team's notice that the present WUA workers have a rather nebulous relationship with the GOK. For the sake of the sustainability of such specialized services, the team recommends that action should be taken to

have these workers put on contracts that conform with GOK standards. Some clarification is needed as to whom these workers should report. According to the view of the team, they should consider themselves to be part of the MOA extension team with special duties, and consequently they should report to the DAO.

4.2.3 Training Needs

Assessment

Since the inception of donor assisted agricultural projects in Turkana district, every Plan of Operation has had a component on training for both agricultural technical staff and farmers. A lot of emphasis has been placed on irrigated agriculture-oriented training which at the time was the corner stone of agricultural development in the district. With the establishment of STAESU the emphasis has been more or less the same for irrigated and rainfed agriculture.

The training of the staff in the district has been on a very low key with no clear cut objectives. Farmers training has been very sporadic and conducted only in the government-sponsored irrigation schemes.

In the annual work-programmes, farmers training has always been given low priority while other activities which ought to be supported by training have been accorded a higher ranking. This means that these activities cannot be sustained by the farmers because they do not possess the skills needed to implement the activities effectively, e.g. the change from furrow-and-ridge irrigation to basin irrigation consisted of a one day visit for 120 farmers to the Lokori or Amolem schemes.

In phase II of the project, one of the objectives was to establish a rural training centre, but this was not realised. The centre could have raised staff morale to train farmers and perhaps the training situation could have improved not only in agriculture but in all other sectors.

Strategies

(a) **The achievement and sustainability of the main objective in agricultural development depends on rigorous and production-oriented training of the farmers. Despite repeated suggestions by different review missions and programme planners, the training of the farmers has continuously been given insufficient attention. More effort and resources should be diverted towards training.**

(b) **To overcome the constraint on communication and to make training more effective, the trainers should come from the Turkana speaking community and whenever practical, they should also be women since cultivation is traditionally a woman's activity. At the same time relevant training packages for the farmers should be identified and tried.**

(c) **A detailed annual training programme with time and target projections, should be drawn up and approved by the project steering committee. Methods of supervision and reporting should be spelt out clearly.**

(d) **Training should be objective and include demonstration/trial plots, barazas and relevant visual aids concise and clear dissemination of information to the participants.**

Constraints to Accelerated Training

1. Technical Staff

   (a) Most of the staff working in the agriculture sector are not indigenous to this district and therefore experience difficulties in communication and lack an understanding of the cultural background of the Turkana.

   (b) Lack of commitment and low staff morale has led to passiveness and a lack of initiative.

   (c) There is a lack of supervision by their superiors.

2. There are inadequate facilities to implement a continuous and dynamic training programme e.g. transport and very low DAO vote allocations.

3. The migratory nature of the farmers makes it difficult to plan training programmes which demand a lot of devotion and dedication on the part of the staff members involved.

Fields of Attention

Area specific problems should be identified and made the subjects of training:

1. Crop Production

The training programme should be drawn up such a way so as to incorporate the time sequence of crop development and to meet the immediate needs of the farmer. This should be done through farmers' demonstration plots and also through barazas.

2. Water-Harvesting Structures: Construction and Utilization

An appropriate approach should be used in the construction of water-harvesting structures to induce a sense of responsibility in the farmers. Construction of the bunds after every season is a time and energy consuming exercise and the farmers should be trained on methods to stabilize them.

The efficient utilization of the water-harvesting structures depends on usage of every possible drop of water for crop production. Proper timing of land preparation and planting is paramount. Discussions with farmers on this subject is therefore important.

3. Soil and Water Management

Soil and water management is the essence of irrigation and therefore there should be incorporated into the farmers' training.

4. Water Users Association and Co-operative Development

These are essential in the irrigation schemes and in other agricultural areas where there is a need for marketing crops.

5. Use of Animal Draught Power and Local Artisans Trained in the Maintenance of the Equipment

The training of farmers should be coordinated and integrated with other activities that are performed by the farmer. At the same time, fora organized by other sectors can be used for training.

Staff training needs and projects are dealt with in Section 4.1.4.

4.2.4 Distribution and Accessibility of Services

Turkana District is extremely vast. It has been divided into 7 divisions and a large number of locations and sub-locations for convenience and ease of administration and provision of services to the people of Turkana (see Chapter 2).

In terms of facilities, the officers at the Divisions are provided with a vehicle (Landrover) and office accommodation while those at the locational level are provided with a motor-bike and operate from the Chiefs' centres. The sub-locational officers operate from their home areas and are provided with bicycles. In addition, all the officers are provided with housing facilities or housing allowances.

At the district level, the DAO is assisted by certain specialists consisting of a District Extension Coordinator (DEC), District Crops Officer (DCO), District Soil and Water Conservation Officer (DSWCO), District Home Economics Officer (DHEO), District Rural Youth Officer (DRYO), District Irrigation Engineer (DIE) and District Marketing Officer (DMO), each with office accommodation, housing or housing allowances, and reasonable transport for ease of dissemination of agricultural technical packages to the farmers. Other officers at the district level may be in charge of specific projects e.g. the date palm project in Turkana.

Each officer is supposed to be in charge of 1000 farmers. Extension personnel ratio should be 1:1000. It is against this background and the MOA policy that the of staff allocations is gauged in order to ascertain whether the services to farmers are reasonably offered in Turkana.

Based on a figure of 1 officer for every 1,000 farmers, Turkana district should have a minimum of 90 technical personnel distributed in all the district administrative positions and projects. The present situation is far from satisfactory; only 44 technical officers are in position. Their distribution is even more skewed as shown below:

Table 4.2. - TECHNICAL STAFF DISTRIBUTION IN TURKANA DISTRICT

POSITION	NO.OF STAFF	NO. OF LOCATION	NO.OF SUB-LOCATION
District headquarters	3	-	-
Lokichoggio	1	-	-
Lokitaung	3	3	7
Kakuma	3	5	11
Lokori	7	6	9
Turkwel	4	5	8
Katilu	20	4	6
Kibish	1	3	5
Central Dates project	1	4	5
Total	44	29	51

Source: District Agricultural Office, Lodwar.

third of the tertiary block leaders are women, but all of the 11 scheme committee members are men. OXFAM's Water-Harvesting Project in Lokitaung Division has found that women are eager to and capable of being involved in all levels of the project. Women account for 25% of the management board membership, 50% of the surveyors and draught animal specialists, 50% of the local committees and 75% of the technical trainees (Cullis, personal communication). It would be beneficial to the schemes as a whole if women played a more active role in the management.

Women are responsible for food preparation in the household, but choice of crops in the irrigation schemes has to a large extent been determined by the scheme management. Whether the irrigated fields provide food directly to the household or indirectly through cash cropping, the tenants, as a group, should be given a choice of what crops they wish to plant.

Because the nature of irrigation requires people to settle, women's status in the society has declined from that held in the traditional system. In settlements, those aspects of the social system which ensure them of a certain level of security break down. Marriage in the traditional system is between two families and the exchange of livestock not only solidifies the arrangement but ties the couple to a larger network of people who will assist them in times of need. The tenants who settled on the schemes did so because they were poor in livestock. Broch-Due and Storas (1983) observed that no formal marriages, eg. the killing of the ox, had occurred among the tenants since their arrival at Katilu. This has resulted in a situation where relationships tend to be unstable and female-headed households occur more frequently than in the traditional system. A woman may then have children by several different men who are reluctant to help support those who are not his own. Women on the schemes are in a more precarious position than their counterparts in the pastoral system and must bear a much greater economic burden. The review team does not foresee this situation changing until scheme households can become economically viable units.

At Katilu, tenants rights in plot registration has to a large extent been neglected - a situation which particularly affected women. In 1982, 25% of the plots cultivated by women were registered in the name of someone who had died or left the scheme compared with only 4% for men (Broch-Due and Storas, 1983). Early in 1989, this system of registration has finally been changed. Under the new system, when the tenant dies or leaves the area, the family decides who will inherit the plot and the new name is formally registered. To date, only 3 such formal transactions have taken place. During the team's visit we were given the impression that sons are inheriting more frequently than daughters. If the registration system was brought up to date, such impressions could be quantified and monitored. **It is suggested that all tenant registrations be brought up to date as soon as possible.**

Four one-week farmers courses were held last year. Approximately 30 farmers, a few from each scheme - Loyapat, Julluk, Nakwamoru, Katilu, Morulem and Turkwel, attended each session. Selection of participants was through the extension officer's discussions with the farmers. Women's participation estimated to have been 40 - 60%, but attendance records give only the total number of participants. Course materials cover a wide range of topics including seed selection and storage, vegetable growing, nursery establishment, crop spraying, utilization of various foods grown in Turkana, animal draught demonstration, improvements on rainfed cultivation, interplanting and diversification of crops. **It would be beneficial to extension workers and farmers in general, and women in particular, if the target group for the farmers courses was expanded to include Turkana cultivators, who are likely to be women, throughout the district.**

It is therefore evident that the distribution and accessibility of personnel goes against the deployment procedure. What is ironic is that the district has no irrigation engineer in an area where resources have been heavily invested into irrigated farming. **It is recommended that a District Irrigation Engineer is posted to the district immediately. It is also recommended that staff be deployed according to established procedures so that farming can be extended to all potential areas in Turkana.**

Given that the distribution, size and potential of rainfed agriculture in the district as a whole is not known, it is recommended that a baseline study be undertaken. It is only after this study that deployment of extension services and logistical support to the farmer can be effectively organized by the agricultural sector in Turkana District.

4.2.5 Human and Capital Resources Available to Sustain Services

The present level of staffing and financing (GOK/NORAD/TRDP) for the agricultural sector may serve as an indication of the level of future GOK funding of agricultural activities in Turkana. Although the size of the district and the potential for rainfed agriculture call for substantial augmentation of field staff and allowances, the team considers it to be neither realistic nor sustainable to consider staff deployment at a level equal to that of the areas of high agricultural potential. Thus the general strategy should be to make more efficient use of those resources which are already available, and possibly allow for recruitment of a limited number of low cadre staff.

In order to make more efficient use of available and future manpower resources through extension work within the field of natural resource management (forestry, agriculture, livestock) a unified approach has to be considered. Field staff, at the divisional level and below, could be pooled for carrying out practical field extension work. A pre-requisite would be that the extension workers are given a minimal amount of training in disciplines in which they have not previously been trained. Furthermore, the skewed deployment of the MOA staff to irrigated agriculture is probably not viable, and should be rectified.

Despite the rapid improvement in housing and infrastructural facilities taking place in Turkana, non-Turkanas have problems with accepting employment for long periods in the district. Turkanas who have been brought up in the area are generally pleased with having the opportunity to work in their home area, and do not perceive it as a hardship post. **Thus, the team suggests that more Turkanas should be recruited as extension staff. This should apply in particular to the lower cadre of staff whose job goals are completely dependent upon the ability to communicate with the Turkanas in their own language. Agricultural extension workers who previously worked with NGOs and were laid off when the programmes were phased out, should be recruited. They should be given further training according to a programme that is acceptable to the GOK and which eventually will qualify them for being included in the GOK staff rank.**

This low cadre of extension workers should preferably be taken on by the MOA from the very beginning. Possible bureaucratic constraints may, however, delay approval and provisions. In the meantime, TRDP should offer financing, provided there is a firm commitment that they will be taken on by the GOK over the following two year period. If such a provisional solution is necessary, the selected persons should be given a contract by TRDP that conforms with GOK norms.

A greater number of extension staff and their need for re-orientation towards rainfed agriculture and other disciplines of relevance would necessitate the availability of training facilities as well as training capacity. It is hoped that the newly built Turkana Teachers Resource Centre (TTRC) will be able to accommodate such training courses. It should be noted that there will be a need for recurrent refresher courses.

The only means of transport that seems to be sustainable at the divisional level are bicycles. Vehicles may be allocated to divisional stations on a temporary basis when special needs arise. Motorized means (vehicles and motorbikes) are not considered to be sustainable, so long as there is a lack of spare parts and maintenance services in the remote areas. Again, in a unified extension system, maintenance can be reduced by building capacity at a very localized level.

A drastic reduction in GOK expenditure on irrigation scheme management and maintenance has taken place. It is still questionable whether the present level of funding (Kshs 1.5 million/year in 1988/89) can be considered to be sustainable. Therefore, efforts should be made to shift further responsibility for desilting the main canals and intakes over to the water users. GOK/TRDP should assist in making desilting exercises easier by possible procurement of simple tools for moving silt. The operations should preferably be done by means of draught power.

Capital resources in the form of irrigation structures (intake, water control gates, canals, basins) may easily deteriorate if proper maintenance is not provided. In most schemes the farmers will be able to cater for water control gates, canals and basins because such duties have been taken on by their organizations, be they co-operatives or WUAs. Normal maintenance work of intakes for desilting and minor repair works may also be taken on by the farmers. A pre-requisite would be that simple mechanized tools would be provided to ease the heavy workload of desilting and removal of sand from canal shoulders. Rehabilitation work, due to damage from floods and rebuilding of intakes where the river has changed course, is seen by the team as being beyond the capacity of the farmers. Therefore, the sustainability is questionable if MOA cannot take on such a responsibility. So far support has been made available by the GOK/TRDP and occasionally FFW. It is not justifiable to continue the services of the STAESU Mechanization Unit beyond the project period (which is coming to an end). It is hoped that the Turkwel Gorge Dam will stabilize the water flow and the course of the Turkwel River. Problems of damaged intakes and changing river courses for the other rivers have been less serious.

The Amolem scheme in West Pokot is practically abandoned. The irrigation structures can be severely damaged by cattle trampling and vegetational regeneration. The team fears, therefore, that the scheme structures will be damaged beyond repair if no action is taken promptly. However, a study of the technical and social feasibility of the scheme should be made before any such action is taken.

4.2.6 Impact on the Women's Situation

Women provide most of the labour inputs into cultivation in Turkana District, whether it is rainfed or irrigated agriculture. Yet at the Katilu irrigation scheme incentives for women have been poor from the beginning. Women have not been sufficiently involved in the management and decision making processes. The situation improved with the creation of the WUA, where women comprise 15% of the committee membership. This year, 1989, is the first time the 9 member Katilu Co-operative Society Committee has had a woman member. At Morulem one-

4.2.7 Follow-up on the Recommendations Made by the Previous FAO and NORAD Review Missions

Source: FAO; Assistance to Irrigated Agriculture in Turkana/Pokot, Kenya: Project Findings and Recommendations; Rome 1984.

Recommendations from the report are summarized below:

1. Future schemes should be limited to about 40 ha for maintenance, and in order to attain an acceptable level of efficiency. The number of household plots under command of a tertiary canal should not exceed 20.
   ACTION: NO NEW SCHEMES HAVE BEEN STARTED.

2. Management through co-operatives should be shelved for the medium term. Instead farmers committees should be encouraged. Efforts must be made to include women into farmers organizations.
   COMMENT: THIS RECOMMENDATION SHOULD NOT HAVE BEEN MADE SINCE BUILDING VIABLE CO-OPERATIVES WOULD HAVE INCREASED FARMER PARTICIPATION IN DEVELOPMENT AND THUS LOCAL CAPACITY.
   ACTION: THE CO-OPERATIVES WERE IGNORED TO THE LONG-TERM DETRIMENT OF LOCAL CAPACITY BUILDING.

3. Cropping patterns should be left to the individual farmers.
   COMMENT: THIS IS NOT POSSIBLE IN IRRIGATION SCHEMES. IT IS POSSIBLE IN SUPPLEMENTARY SCHEMES. SINCE THE SCHEMES WERE NOT PLANNED AS THE LATTER, IT WAS NOT FEASIBLE.
   ACTION: NOT DONE.

4. Local cattle owners should be allowed to utilize crop residues immediately after harvest.
   ACTION: DONE

5. In order to reduce operating costs, mechanical equipment and surplus tractors will have to be removed.
   ACTION: DONE.

6. The Katilu Farmers Co-operative initially developed too fast. It was recommended that the Co-operative start up again at a slower pace so that the members understood and accepted the purpose and benefits of the Co-operative.
   ACTION: NOTHING HAS BEEN DONE BY THE PROJECT ABOUT THE CO-OPERATIVE.

7. Courses for farmers/irrigation overseers should stress the collective timeliness of farming activities, and the need to fill basins in order to avoid wastewater, water-logging and maintenance of canals.
   ACTION: DONE.

8. Agricultural Extension Support Unit staff should be experienced in irrigation practices and water management, and in organizing water users for management and maintenance of irrigation systems. Also attention should be given to water-harvesting techniques.
   ACTION: A) WATER USERS ASSOCIATIONS AT KATILU AND TURKWEL HAVE BEEN ORGANIZED.
   B) SUPPORT STAFF HAVE FORMAL QUALIFICATIONS.
   C) LIMITED WATER-HARVESTING HAS BEEN INITIATED IN KATILU BUT NOT IN THE OTHERS.

9. Fish ponds at Amolem should be re-established with advice from fisheries experts.
COMMENT: AMOLEM IS A DISASTER BUT THERE ARE TREES GROWING WHERE THERE SHOULD BE IRRIGATED CROPS.
ACTION: NOT DONE.

Source: FAO; Assistance to the Agricultural Extension and Support Unit in South Turkana: Termination Report; Rome 1986.

Recommendations from this report are:

1. The flooding problem at Katilu is expected to be mitigated by the Turkwel Dam. However it was suggested that immediate steps for improvement of flood protection works are undertaken in the intake and feeder canal areas.
ACTION: NOT DONE.

2. New cropping patterns and irrigation schedules should be implemented through extension, demonstration and monitoring.
ACTION: PARTIALLY DONE.

3. At Turkwel, buckets and windlasses should be used to overcome problems associated with the maintenance and funding of hand pumps.
ACTION: DONE.

4. Agricultural production should focus on dates, citrus, mangoes, and vegetables form irrigated shallow wells.
ACTION: DONE, BUT NOT SUCCESSFULLY.

5. Farmers organizations should eventually be responsible for marketing of produce.
ACTION: DONE.

6. At Amolem,
a) The task force should continue till an effective farmers organization is formed.
ACTION: DONE.
b) Abandoned/under-utilized plots should be re-allocated.
ACTION: DONE.
c) Famine relief distribution should be made more effective, leading to eventual withdrawal of relief.
ACTION: DONE.

7. Nakwamoru and Julluk could become more self-supporting on conversion to basin irrigation, and there is thus a need to persuade farmers to accept basin irrigation and to rehabilitate irrigation and drainage systems.
ACTION: DONE.

8. Kalemenyang should essentially remain a water-harvesting project. It was felt that investment to complete it as an irrigation scheme is not appropriate at the time.
ACTION: DONE.

Recommendations in connection with STAESU:

1. Close cooperation required with District Officers and other district personnel.
ACTION: DONE.

2. Work programmes for individual extensionists should be established.
ACTION: DONE.

3. There should be fixed visits by senior staff.
ACTION: DONE.

4. Monthly seminars must be held at Katilu.
ACTION: NOT DONE.

5. Chiefs and DOs should be encouraged to participate in the bi-monthly STAESU meetings.
ACTION: PARTIALLY DONE.

6. Field extension workers should be trained in crop/water relationships, irrigation methods and management.
ACTION: DONE.

7. There should be no future reductions in non-technical staff.
ACTION: PARTIALLY DONE.

8. Further support must be given to training and motivation activities.
ACTION: DONE.

9. Adequate staffing of water management sector is necessary, and the number of Turkana staff must be increased.
ACTION: NOT DONE.

10. The Provincial Irrigation Unit must adopt a close supervisory role to STAESU.
ACTION: NOT DONE.

11. Technical support to agronomy/extension section of STAESU should continue.
ACTION: NOT DONE.

12. A senior extension adviser must assist in establishing work programmes and extension schemes.
ACTION: NOT DONE.

13. Smallholder developments should take into consideration investment and planning, the simplicity of construction and operation, maximum use of hard labour for construction, farmers participation at all stages, and basin irrigation to allow manual land preparation.
ACTION: DONE.

Source: NORAD; Sectoral Review on Irrigation with Reference to the Turkana Agricultural Extension and Support Unit Project Proposal: 1984-1987; October 1986.

Recommendations from this report are summarized below:

1. No expansion of irrigated agriculture should undertaken in the region until the water resources are better surveyed and the consequences of the Turkwel Gorge Dam and its implications on the livestock sector are known.
ACTION: DONE.

2. The Amolem administration has been transferred to the West Pokot District. STAESU however is to continue its services to the scheme during the transitory period.
ACTION: DONE.

3. The Turkwel/Kaekorongole scheme should be discontinued as a river water scheme. Future irrigation should be based on ground water wells with appropriate water-harvesting techniques.
ACTION: BOTH RECOMMENDATIONS DONE.

4. Funding of the date palm project should be transferred from the Forest Department to the Ministry of Agriculture.
ACTION: DONE.

5. Farmers co-operatives should be encouraged. Different self-help groups should be organized for different requirements according to identified needs.
COMMENT: THERE IS NO ANALYTICAL OR ORGANIZATIONAL LINKAGE BETWEEN SELF HELP CAPACITY AND CO-OPERATIVES. THE RECOMMENDATION IS THUS MEANINGLESS.
ACTION: DONE.

6. The outstanding debts of the Katilu Co-operative Society should be written off.
ACTION: NOT DONE.

7. Off-scheme agriculture should be given more attention as this is an important grain producer in the area.
ACTION: INITIATED.

8. Tree planting within the schemes and farmers' settlements should be promoted more actively.
ACTION: DONE.

9. Physical planning of farmers settlements are important in checking undesirable environmental effects.
ACTION: THE STATEMENT WAS NOTED !

10. Material and financial support to STAESU should continue.
ACTION: DONE.

11. Support to the machinery and maintenance unit at Katilu should continue.
ACTION: PARTIALLY DONE.

12. Priority must be given to food crop growing, although some provision for limited cash crop growing also must be made.
ACTION: DONE.

13. Studies should be carried out on the construction of low-cost but stable water intake structures, with the emphasis on the silt load problem.
ACTION: NOT DONE.

14. The introduction of draught animals for primary cultivation and desiltation is encouraged. Internal transportation must also be encouraged and developed through interested farmers.
ACTION: VERY SMALL-SCALE ACTIVITIES INITIATED.

15. STAESU should continue demonstration plots for both on- and off-scheme agriculture.
ACTION: NOT DONE.

16. Experimental plots with new crops should be sited away from farmers and managed by STAESU extension officers.
ACTION: NOT DONE.

17. Training of extension staff should cover practical aspects of irrigation agronomy, rural sociology, irrigation practices and extension methodology.
ACTION: FORMAL TRAINING ASSUMES THE SAME.

CHAPTER 5 - FORESTRY

5.1 DESCRIPTION AND ASSESSMENT OF NORAD-SUPPORTED ACTIVITIES

5.1.1 Extension, Education and Training

Extension is the most important part of the Forest Department's activities in Turkana District. It is aimed at creating awareness among the people of the importance of protection and management of forests. In the settled areas, extension establishes close links with the local communities. Extension and education forms the basis for conservation and woodland management.

The goals of extension and training include:

- creating a broad awareness of forestry and woody species related issues amongst the settled and pastoral populations;
- giving the people the responsibility of environmental conservation, utilization and improvement, also involving problem identification and solution implementation;
- increasing the technical level and competence in forestry activities. This is achieved through training courses for different target groups like patrolmen, nursery workers, extensionists, local leaders, teachers and other related persons by circulating information about forestry in the district and also through field visits;
- strengthening the manpower development of the forest department through training.

The main focus of extension work is a series of woody species management training seminars at the locational and sub-locational levels to create awareness and responsibility amongst the local people. In the locational courses, each division conducts one three-day locational seminar per month. These courses are participatory in nature and involve practical field visits in the area. The training also involves locally organized residential courses. These cover a wide range of technical issues relating to the woody resources in the district, with emphasis on conservation and management, afforestation and raising seedlings in the nurseries.

Table 5.1 - Summary of Divisional Courses, 1988-1989

Division	No. of Courses	No. of Days	Attendance
Lokitaung	10	20	460
Kakuma	15	30	860
Kalakol	9	17	407
Turkwel	12	18	505
Katilu	8	8	319
Lokori	5	10	253
Total	59	103	2,804

Source: Turkana Rural Development Plan, 1988 Annual Report

In summary, 2,202 people attended 44 two-day courses and 602 people attended 15 one-day courses in the district during 1988/1989, representing a total attendance of 2,804 people (Ref. TRDP, 1988).

The forestry and conservation courses participants included: area chiefs, councilors, local elders, government staff, non-government organizations, women, TRP staff, facilitators and forestry department staff.

Table 5.2 - BREAKDOWN OF ATTENDANCE BY DIVISION

Participant	D i v i s i o n						
Community General	Lokitaung	Kakuma	Kalakol	Turkwel	Katilu	Lokori	District Total
Elders	195	260	354	345	32	46	1454
KANU	45	19	53	21	24	10	192
Adult Lit	4	3	8	4	0	0	22
Traders	1	8	2	3	9	0	37
Women	58	370	93	28	9	31	716
GOK							
Fisheries	15	0	34	0	0	0	50
Forestry	10	1	12	23	8	0	62
Education	5	1	6	4	12	0	42
Health	2	2	15	0	1	0	22
Water	4	1	0	0	0	0	6
TRP	39	24	65	8	5	0	151
Chiefs	1	3	2	10	1	2	23
Agriculture	0	0	5	2	1	0	23
MOTC Staff	0	3	0	0	0	0	3
NGOs	6	2	104	0	16	1	147
Others	1	6	1	0	0	0	9
Participants	394	708	756	451	119	92	2,970
Facilitators	78	34	87	37	18	11	307
Attendance	472	742	843	488	137	103	3,277

Source: TRDP, 1988-89 Yearly Report

During 1988, nearly 4,000 copies of the 'Forestry Handbook for Primary School Teachers in Turkana District' were distributed by the Forestry Department. The In-service Teachers Training Courses formed the basis of the handbook. The department also helped in facilitating the annual one-week courses for Moi University's Second Year Students, which stared in 1985.

The Department also holds a tree planting competition for all primary and secondary schools in the district. This is achieved through a joint venture between the Forest Department and the Ministry of Education. The analysis of the tree planting competition involves:

- exotic tree species planted
- indigenous trees planted
- survival rate of the trees
- who plants the trees
- how they are planted
- occurrence of naturally growing trees
- tree growing hardships

- tree protection after planting
- tree felling
- forestry related subjects
- assessment of teachers scheme of work and class notes
- water source and distance
- location of school (i.e. site)
- soils in the school site

5.1.2 Tree Planting

Background

Tree planting in various parts of the district has been a central component of forestry sector since the inception of the programme in 1981. Essentially outplanting is carried out under a number of schemes i.e. FFW, paid incentives to maintain trees, school and church woodlots etc.

In the early years of tree planting activities, only a few seedlings were planted. With more funds and experience the rate of outplanting has been on the increase although no data is available on survival rates.

Table 5.3 - NUMBER OF SEEDLINGS PLANTED

Year	Seedlings Planted	Estimated area
1984-1986	67,526	226 ha
1987-1989	832,474	2774 ha
Total	900,000	3000 ha

Source: DFO, personal communication

Forest Department has been supported by the Rural Development Fund (RDF) in planting a number of areas such as Moi Gardens in Lodwar town. The project was completed in 1987. About 10 ha were planted under this scheme. In addition the Forest Department has been planting trees under the scheme of paid incentives for tree maintenance in places such as Kakuma and Lokichoggio. TRP on the other hand has been planting trees under FFW programmes. Forest Department nowadays pays casuals wages to assist in their activities.

A number of schools have also planted trees through assistance from the Forest Department and NGOs, such as Faithhomes of Kenya, the Full Gospel Church and other missions in the district. The numbers of trees planted through the assistance of NGOs has not yet been assessed, but estimates in 1986 were in the range of 11,000 seedlings (Ref. TRDP, 1986).

Kerio Valley Development Authority (KVDA) has been active in tree planting at Kainuk where it also maintains a tree nursery. KVDA has also carried out some limited forestry activity in Kibish Division. The Forest Department has now begun forestry activities in Kibish. Recently, a Forest Officer, casuals and tree nursery materials were sent there.

Tree planting is frequently undertaken using micro-catchments of 10m by 10m in the dry parts of the district. In the relatively wetter parts of the district such as Kakuma, Lokichoggio and Turkwel, micro-catchments of 5m by 5m have been adopted. So far a total of about 500,000 micro-catchments have been planted in the district. Most of the micro-catchments are v-shaped. In the flat areas, square ridges of 10m by 10m have been used. The most common tree

species planted is Prosopis chilensis. More and more indigenous trees are being planted and most tree nurseries produce seedlings of both indigenous and exotic tree species.

Assessment

Tree planting is a fairly expensive exercise which calls for cost-effective methods if tangible results are to be achieved. The different tree planting schemes are associated with different costs. From discussions with the TRP Area Coordinators, it seems that FFW is cheaper per unit tree than daily payment for work done. Several arguments in favour of and against FFW have been advanced. Generally, while the programme may be justified in remote parts of the district where people may not be able to buy food, it would appear that in easily accessible areas, the scheme has outlived its functions due to its tendency to keep communities dependent.

The incentive tree planting scheme has been paying Ksh 1/= per tree each month that it survives, for up to a maximum of 500 trees. By simply protecting the planted trees, the people involved have been able to earn 500/= per month each for up to 18 months, the age when trees can survive on their own. The scheme has merit in ensuring increased tree survival, but it is expensive and therefore unsustainable.

Discussion with various organizations and literature reviews indicate that there are other governmental organizations and NGOs doing tree planting (see Chapter 8). It is feared that there has not been the necessary coordination between forest officials and all these other agents. Hence necessary technical guidance is lacking. Consequently the survival rate of trees at a number of sites has been rather low. High mortality rates were also noticed in micro-catchments.

The Forest Department maintains a fairly accurate record of tree seedlings issued each year. However, in some cases, due to improper micro-catchment preparation, late planting and mishandling of seedlings in transit, a significant number of trees do not survive. This is a national issue, affecting all parts of the country but particularly the arid and semi-arid areas. As noted in the 1986 review there is a need for a systematic survey of seedling survival rates at an appropriate time after the initial tree planting, to confirm or repudiate the current estimate of survival which ranges from 14 to 45 per cent (District Forest Officer, Lodwar).

A discussion with local people, who had attended seminars on tree planting at Kakuma, revealed that people know what type of trees to plant. Specifically the people had a liking for exotic tree species which were described as fast growing. However due to the government policy of promoting indigenous trees, foresters continue to grow them, and in some cases produce far more than required.

Recommendations

The Forest Department has now discontinued the tree planting incentive payment scheme. Some people are willing to plant trees without the scheme. This should be encouraged. The tree planting incentives for pay should only be used as a last resort, and then on a very small-scale.

The FFW scheme should be minimized in tree planting. People should be paid wages for planting trees in selected public areas. People will, however, plant trees in their own compounds on their own initiative.

Regular interaction should occur between the Forest Officer and church groups, schools and other organizations involved in tree planting activities such as KVDA and TRP. Such collaboration would lead to an informal yet valuable exchange of knowledge and experience in tree planting.

Before large-scale production of indigenous tree seedlings is undertaken in the nurseries, more extension work on indigenous tree promotion needs to be done. This will minimize possibilities of producing seedlings which nobody wants to plant in their land. In this context, the proposed increase of nursery capacity to 1 million seedlings per year should only take place if these issues are settled.

During the field visits, the review mission noted that areas adjacent to settlement schemes and urban areas are denuded of trees. Overgrazing and cutting of trees for firewood, charcoal and poles have led to severe vegetation and soil degradation. These areas should be given priority for community and individual afforestation. Tree planting demonstrations , in areas such as Kakuma, indicate that with proper micro-catchment preparations, trees can successfully be grown in areas such as Katilu and Lokori.

Fuelwood plantations around urban areas have been suggested as a possible strategy for minimizing fuelwood problems. In Lodwar, die back of Prosopis chilensis has been noticed, although this is the most widely planted species in the district. Careful attention should therefore be given to the screening of candidate tree species for such a programme, even though the programme is likely to be small-scale.

Tree planting is a fairly expensive exercise, from the initial stages of seedling production at the nursery to the field planting. Simpler ways of growing vegetation should be pursued. It is believed scarifying soil in some hard pans could lead to rapid regeneration of important tree species such as Acacia tortilis. For example, near Katilu bulldozers' work led to better vegetation growth compared to adjacent areas which were not disturbed.

5.1.3 Agroforestry

Background

Agroforestry is a term which refers to a land use system which combines the production of crops, livestock, and trees on the same piece of land simultaneously or sequentially. Trees are the common component. For a land use system to qualify as an agroforestry system trees, either planted or intentionally left, must have an influence on the agricultural production process.

The land under agroforestry is limited in Turkana District. Most of the land is either woodland/bush, or sand dune. Silvo-pastoralism, which combines tree and livestock production, is the nearest type of agroforestry practiced even though most of the trees in the range are not intentionally left to benefit livestock.

There has however been some tree planting along irrigation canals at the Katilu Irrigation Schemes. There several species of exotic and indigenous trees have been planted. The main tree species planted are Leucaena lencocephala, Prosopis chilensis, and some Eucalyptus camaldulensis is also planted.

Occasionally, in rainfed agricultural areas, indigenous trees have not been cut down in the course of preparing agricultural plots; in general this was because the trees were too big to cut during the initial preparation of land. In rare cases remnant Acacia tortilis are left to provide pods for livestock after the crop harvest.

Outside the irrigation and rainfed agricultural areas, the natural vegetation provides multiple benefits, such as fuelwood, building materials, fodder, fruits, honey and gum resin, but this natural system does not qualify as agroforestry. Planting in urban areas and villages has been aimed at the local environment rather than as an agroforestry land use form.

Assessment

The biggest problem facing irrigation schemes in the district is that of siltation of canals. Erosion of the canal banks is common. Riverbank erosion destroys agriculturally productive areas. Planting trees along the banks or protecting the existing riverine trees will help to stabilize riverbanks and hence minimize river deviation with its consequent repercussions. The role of riverine forests in the overall economy of the district is so conspicuous that agroforestry can easily be put into practice without any hesitation on the part of the local people. Water losses through leakage in trapezoidal bunds resulting from lateral tree root development can also be minimized by planting trees on the lower sides of the bunds.

Water losses through evaporation in irrigation schemes are in the order of 2400 mm per year (E. Barrow personal communication). Such high losses of water can be minimized by planting trees or leaving the existing trees on the irrigation schemes.

The general absence of trees in gardens which are being developed points to a lack of coordination between the agriculture and forestry sectors. Indeed it appears that to some extent various agents promoting rainfed agriculture are working in isolation from the forestry sector.

Silvo-pastoralism is practiced in the district. Acacia tortilis trees along riverine forests have been intentionally conserved to provide fodder for the livestock. In the dry season, forests provide a major source of fodder and therefore an important means of survival for a community that heavily relies on livestock both for diet and cash income.

Recommendations

Efforts should be increased to promote agroforestry, particularly in areas where rainfed agriculture is practiced. This is significant in view of the potential that rainfed agriculture has and in the face of the problems associated with irrigation schemes in the district.

Production of seedlings in the tree nurseries should pay special attention to those trees that have soil stabilizing properties for use on canals and garden bands.

To supplement dietary requirements, the planting of several wild fruit-bearing trees should be given priority in rainfed gardens and irrigation schemes. There are abandoned plots on some of the irrigation schemes such as Amolem and Nakwamoru. The periphery of these plots should be planted with multipurpose trees.

Future extension work should place more emphasis on the interaction between trees, livestock and crops. The current emphasis, as evident from the 1989 forestry extension impact survey, is on tree planting, tree protection and tree conservation.

There is a need for a unified approach by the agriculture, range and forestry personnel in promoting agroforestry systems.

5.1.4 Tree Nurseries

Background

All administrative divisions in the district have tree nurseries. These are: forest department (9), Chiefs (3), TRP (8), Schools (2) and AIC (1) with an annual production of 869000 seedlings.

Emphasis for seedlings production is on indigenous species like: Acacia tortilis, A. eliator, A. albida, Azedarachta indica, Cordia sinensis, Diospyros scabra, Dobera glabra, Salvadora persica, and Zizyphores mauritania. However, the main planting, and hence seedling production activities are centred around Prosopis chilensis and Parkinsonia aculeata, both exotic species. KEFRI's range of species is larger, since they have to raise seedlings for species and provenance trials.

Raising of seedlings is based on demand mainly from TRP, churches, KANU, Schools, Women groups and Forest Department own annual planting programme.

Assessment

Seedling production is closely associated with actual field planting activities, and hence demand. This is a sign of a well coordinated teamwork approach between the different sectors involved. A positive correlation exists between species raised in the nursery and those sought after by the groups involved with tree planting. However, the species range is very narrow, limited to only Prosopis chilensis, Acacia tortilis and Parkinsonia aculeata for large-scale plantings. Other useful indigenous species like Dobera glabra have been excluded from large-scale planting programmes, which are characterized by slow growth rates in the field, and therefore they comprise only a small proportion of the seedlings in the nurseries.

Seedling health looked fine. The potting mixture used to raise them was developed in the district. This has a 5:3:1 ratio of soil, sand and goat manure - hereafter referred to as the "Turkana standard". Nursery activities for seedling production are closed linked to handling stresses and expected site conditions to which seedlings are eventually planted. This requires seedling rearing processes and seedling physiological qualities to be closely monitored in order to meet expected planting site conditions.

Use of small containers to cut on costs was questioned by the previous review mission in relation to the physiological quality . As a result, larger containers were recommended. But, large containers are expensive, require more soil to fill them, and result in a situation where only a smaller number of seedlings can be transported to the field given the current transport system (pick-up vehicles). However, new scientific evidence from New Zealand Forestry Research Institute indicates that small containers can be used to gradually reduce available nutrients while at the same time conditioning them to withstand planting stress (hardening-off). Much thought must then go into formulating the potting mixture.

Pests (termites, and aphids) are a big problem in the nurseries. These affect production targets, and also the health of resulting stock; hence the seedlings are not healthy enough to withstand the stresses associated with planting on site.

Labour productivity in nurseries is very low. This is probably a result of the harsh environmental conditions and possible unwillingness on the part of the workers do the job properly. Closer supervision by the technical staff should be emphasized if the problem is to be overcome.

Most foresters, during the period under review, did not have access to transport facilities. This naturally affected performance in all areas of forestry, including productivity.

Recommendations

Data and documentation is urgently needed on nursery management of other potential indigenous species with a view to including them on the species list for reforestation. KEFRI should develop its work programme in such a way as to determine when to collect seed, seed pre-sowing techniques to break dormancy, and nursery management schedules for potentially useful species.

KEFRI should investigate and recommend the possibility of using other types of seedling containers other than the polythene tube. The production cost of seedlings, the quality of seedlings produced to withstand stress due to handling and planting on site, and the vigorous growth after planting should be the guiding factors in this selection.

Production of physiologically balanced seedlings is a dream of every tree nursery headman. However, appropriate seedling manipulation procedures are unknown under the ASAL conditions. Therefore, studies to formulate shade, watering and fertilizer regimes, which will result in the production of seedlings of high physiological quality, should be initiated.

It is recommended that studies are carried out to determine the best timing for seed sowing in the nurseries in order to synchronize seedling growth rates for the various species. The aim is to raise seedlings of uniform size and standardized quality. The results should state management schedules and the period over which each species is expected to attain a given size.

To increase labour productivity and efficiency, it is recommended that all nursery headmen enrol for in-service courses at KEFRI's Kitui Social Forestry Training School.

The review mission recommends that both KEFRI and the Forest Department be adequately supported with logistics to enable them implement work programmes.

Schools and NGOs should be encouraged to start tree nurseries with technical support from the forest department.

The mission feels that tree nurseries should be decentralized to avoid transport damage and costs associated with distribution.

5.1.5 Regeneration

Background

In general, two methods of regeneration exist: natural regeneration and artificial regeneration. Both are practiced in the district to a varying degree.

Natural regeneration in Turkana involves enclosing an area so that there is a minimal of interference from man in the germination and growth processes. To understand how natural regeneration operates, KEFRI and TREMU have a series of experimental enclosures at Napuu, Nadapal and Kalatum.

Tree establishment may be the most important, in that it offers man a chance to influence and direct the course of reforestation. However, understanding how

nature operates also provides useful information that may supplement information obtained under artificial conditions. To increase the efficiency of seedling production and to improve seedling physiological quality to meet the expected standards of the planting site, various nursery research projects are recommended under Section 5.1.4.

Assessment

Preliminary results of various regeneration studies are available from both KEFRI and TREMU. Although the main factor influencing the results is protection (fencing) from browsing by livestock and game, the level of browse impact varies by species. However, the usefulness of the research findings may be overshadowed by the high fencing costs and thus make the innovation less likely to be adopted. Therefore, the biggest challenge facing both KEFRI and TREMU is how to make natural regeneration a practical and acceptable alternative to artificial regeneration. Important species, which have difficulty in regenerating naturally, are Hyphaene coriacea, Dobera glabra, Salvadora persica and Diospyros scabra.

Raising seedlings in the nursery and planting them in the field form the core of a reforestation programme whose costs are very high, considering that:

(a) the survival and vigorous growth of outplanted stock depended on paying the Turkana to water and protect the plants;

(b) seedlings have to be raised, transported and distributed free of charge;

(c) that survival of outplanted stock is bound to be very low due to the harsh environmental conditions; and

(d) that site preparation costs are currently to be borne by the Forest Department.

Therefore, whether forestry and reforestation in the district will grow to become a self-sustaining and popular occupation depends on whether practices aiming at cutting costs may be developed. One option is to cut down on all nursery costs while at the same time increasing the planted stock's probability of survival on the reforestation site. Direct seeding may be a solution.

Recommendations

KEFRI should expand its current studies on natural regeneration to cover analyses of changes and development of grasses, the combined effect of protection and scarification, scarification and seeding, the influence of soil chemicals and physical fertility on seed germination and growth rates of different plant species.

KEFRI and TREMU should study the economics of natural regeneration with a view to developing alternative tree establishment methods.

KEFRI should immediately initiate direct seeding experiments to generate data that will guide timing of seed sowing, seed pre-sowing treatments for species with dormancy, site preparation methods required to enhance germination and eventual growth of plants and tending schedules where necessary.

5.1.6 Conservation

Background

The Forest Department's work in the conservation and management of trees is focused on four ecosystems. A brief description of each ecosystem and the tree species associated with them are listed below. For a more detailed description, the 1986 TRDP Forestry Review (TRDP 1986) should be referred to.

Riverine forests are located along the river systems in the district. The major tree species are various types of Acacia and Cordia species, and also doum palm (Hyphaene coriacea) which has a higher occurrence near Lake Turkana than elsewhere. All three tree species are important to the Turkana: Acacia trees provide firewood and the poles for household construction for the people, and fodder (leaves and pods) for the livestock; Cordia species are also used for fodder and building materials; doum palms provide materials for baskets and building as well as edible fruits.

The plains, which are composed of sandy, stony or heavy clay soils, mainly consist of grasses. The little woody vegetation that exists is for the most part in the form of Acacia tortilis, Acacia eliator, Dobera glabra, Cordia sinensis, Salvadora persica, and Balanites species.

The hills are very stony and contain mainly Acacia species. A tropical mountain forest similar to those found in the Aberdares is found at the summit of the Loima Hills, the highest hill in the district.

Sand dunes are found along the lakeshore and in areas where rivers have changed course. The doum palm is the dominant species; some Acacia and broad-leaf tree species also grow in these areas.

Recommendations

Since many of the recommendations of the 1986 forestry review (Ref. TRDP 1986), which the team concurs with have not been implemented, this mission has incorporated them into the present recommendations.

The management and conservation of riverine resources near settlements should be given priority.

An inventory of forest resources in Turkana District, particularly of the riverine forests, is needed. TREMU is currently conducting research on woodland ecology with an emphasis on riverine forests. TREMU should liaise with the Forest Department and KEFRI to ensure that there is no duplication of activities.

Fuelwood plantations should be established in the urban centres, particularly Lodwar, Kakuma and Katilu. The planning of the plantations should take into consideration the fuelwood supply needed by the settlements.

Bare hillsides should be protected and where possible afforested to allow natural regeneration to take place. Reseeding should be done where possible. Such sites would serve as demonstrations of what can be achieved.

There are no gazetted forests in Turkana District. General forest rules under Section 15 of the Forest Act should specifically be made to allow Turkana people continued usage of any forests in the district once gazetted. The important woodlands on the Loima Hills should be gazetted under the conditions that rural people have access to these areas particularly during the dry season.

5.1.7 Research

Background

During the period under review, KEFRI established a permanent presence in Turkana district by opening a station in Lodwar (1986). Since then, the station has quickly taken-over all previous research plots initiated by the Forest Department and analyzed, summarized and disseminated the data. The station has also initiated new research projects. Realizing that KEFRI's goal in Turkana is to provide management in reforestation programmes, it therefore operates very closely with the Forest Department.

The station completed building an office and laboratory block by mid-1988 and now is in the process of building a senior residential house.
Owing to the fact that the station is new, it has no established routine, the officer-in-charge is a young and inexperienced researcher, and all research planning and drawing-up of workplans are developed at KEFRI headquarters in Muguga. Presently, this is the best approach, although it has its shortcomings. For example, if not well monitored, it may lead to the formulation of unrealistic workplans and research objectives.

Assessment

Currently KEFRI's research work covers browse species trials, nursery practices, vegetation dynamics studies, studies on plant resins (Gum arabica), species and provenance elimination trials, fodder production on saline soils and plant phenology studies.

Routine work covers plot maintenance operations, assessment, data analysis and writing-up of reports. Research reports distributed to date are:

- a summary of all research plots as of July 1, 1989,
- the results of fodder production on saline soils in Turkana, and
- the influences of different micro-catchment sizes on the performance of different species in Turkana.

Recommendations

Although a great deal of energy went into the establishment of physical facilities originally, the progress achieved in the space of two years has been good. However, as rural development in Turkana gains momentum, the demand for quick multi-disciplinary and accurate data from KEFRI and TREMU will increase. In order for KEFRI to prepare and plan to face these challenges, the following will have to be considered:

- **The station's research planning will have to be decentralized from Muguga to Turkana;**
- **A rigorous training programme will have to be set up for its staff so that they may furnish useful information needed for the district's planning;**
- **Logistical support is required to enable smooth implementation of the station's work plans;**
- **KEFRI should study the economics of the current popular micro-catchment tree planting programme;**

- Since gum arabica is a potentially useful product for Turkana district, KEFRI should commence studies to determine the best harvesting methods, seasonal and family variants in yield, selection, breeding strategy and stand management for high yielding populations and to develop gum processing and a marketing strategy for the product;

- KEFRI should initiate studies to find out why Prosopis chilensis and P. juliflora are dying back on some sites and whether this is due to provenance variation (genetic). If so, could it be solved by proper matching of provenances to site? Or it is a physiological problem that could be solved by simply appropriate management?

- KEFRI should initiate studies that will lead to understanding how the various sizes and designs of micro-catchments work. This information will help in modifying and improving the designs for better labour and moisture efficiency;

- KEFRI should work in close cooperation with TREMU in order to avoid overlapping.

5.1.8 Staff Training

Background

At the professional level, the Forest Department has been manned by officers who have university forestry degrees and diplomas. The current District Forest Officer has an MSc Forestry in dryland afforestation from the United States. Moi University has also been producing forestry graduates who have worked in the district in the past. In fact the Research Assistant heading the KEFRI programme is a forestry graduate from Moi University. The Assistant Divisional Forest Officer has a BSc Forestry.

All the field foresters are diploma holders of the only two diploma granting institutions, i.e. the Kenya Forestry College in Londiani, and Egerton College. The latter institution has now phased out its forestry programme after gaining university status.

One main feature of staff training is that the diploma foresters have had very limited in-service training. Only three foresters have been to social forestry course at Muguga which was organised by KEFRI/ Japan International Corporation Agency (JICA).

The Forest Department as a whole has a policy of sending a limited number of Forestry diploma holders to University both locally and abroad. In line with that policy two foresters in Turkana are earmarked to go to Sokoine University to take courses in dryland afforestation. Efforts are also being made to send some foresters to Moi University. In some cases there is no guarantee that the foresters will return to their duty stations after completion of training. In fact such training leads to promotion and re-deployment to other areas earmarked for graduate personnel. Forest guards, patrolmen, and tree nursery staff have not had any formal training in forestry.

The situation differs in KEFRI where further training is usually viewed as strengthening of research capability. KEFRI has a strong training programme. The current research assistant is earmarked for postgraduate study abroad. Other Forestry graduates within KEFRI elsewhere have been sent for masters and doctorate training. Comprehensive projection of training needs is discussed under the Training Needs section (see Section 5.2.3).

Assessment

The main issue which stands out clearly on staff training is that most of the staff are not really trained to cope with the challenges of Turkana forestry. Working in Turkana calls for totally different approach from that used in the high potential areas of Kenya. As can be deduced from forestry courses both at university and diploma level, there is very little course instruction on dryland afforestation.

Fortunately the forest staff are learning to deal with various issues of forest resource production, conservation and management. The main danger is that of staff being posted to other parts of the country requiring more skilled personnel. There has been a rapid turnover of district forest officers. Over the past four years, about four District Forest Officers have served in the district. The post of Assistant District Forest Officer is also a kind of training ground where permanence has not been achieved.

Other than graduate and diploma officers, there are no other formally trained staff in the field. The patrolmen, who actually conduct a fair amount of extension work, have not had any forestry training. Similarly the nursery headmen have not been trained. Under the circumstances it would appear that these categories of people rely on on-the-job training by the forest officers. Systematic training would expose all such people to the most pertinent forestry issues. As it is, trial and error cannot be ruled out.

Forest guards in the district help in control and management of trees and woodland, a fairly delicate operation which needs some skill.

Recommendations

The divisional foresters who are actually the front line staff have not had training in dryland forestry. It is recommended that all the eight divisional forest officers be given six months training in dryland forestry. Training should be done over a four-year time period, i.e two foresters per year.

The district has had a rapid staff turnover. Such a turnover disrupts progress in meeting the challenges of forestry in the district. It is recommended that for the sake of continuity and sustainability of various forestry programmes, staff transfer be restrained. This is especially relevant to those staff who will be trained to specifically deal with dryland forestry.

Patrolmen in the district are charged with the tasks of permit control and protection of forest resources. They have also been used on forestry extension courses. They should be given some systematic training on various relevant forestry issues.

The Forest Department used to train forest guards mainly on policing issues and licensing policy. Due to lack of funds, the Department no longer trains forest guards. In Turkana forest guards play a vital role. The 28 forest guards need to be trained so as to enable them deal with forestry extension and to see that vegetation is being used in accordance with the agreed policy.

Training facilities should be made available for the above-mentioned purposes. Such facilities can also be used for training chiefs, teachers, elders and NGOs on forestry extensions. There is also a need to train nursery headmen on various aspects of tree nursery management. Resource people should be drawn from within the district with one coordinator for the training programme.

5.2 GENERAL ASSESSMENT AND RECOMMENDATIONS ON THE FORESTRY SECTOR

5.2.1 Management

Forest management in the district takes place on a relatively low level when compared to forestry activities in the high potential areas of the country. In fact forestry activities in Turkana have for many years been relegated by the Forest Department which did not recognize forestry in the district simply because there were no gazetted forests as per the Forestry Act Cap 385.

In 1977, the Rural Afforestation Extension Service (RAES) was started in Turkana when the first forester was posted to the district. Even now the number of staff are too few to practice active forestry management, which includes the management of the extensive woody vegetation in all parts of the district. Understandably, the Department has focused on the issuance of permits for various activities and the creation of awareness through short courses for elders, chiefs, teachers, etc.

Before 1984, the Forest Department wanted many woodlands in the country to be gazetted. In 1984, a Presidential directive which discouraged tree cutting, empowered forest officers to control the use of forest reserves. Nowadays a permit is needed to cut any of the important trees. Non-important trees may be cut as before without a permit. The following trees have been classified as being important and non-important:

Table 5.4 - CLASSIFICATION OF VERY IMPORTANT AND NON-IMPORTANT TREE SPECIES

Very Important Trees	Non-Important Trees
Acacia tortilis	Cadaba rotundifolia
Cordia sinensis	Acacia senegal
Zizyphus mauritania	Acacia reficiens
Acacia albida	Acacia nubica
Tamarindus indica	Grewia species
Salvadora persica	Cassia species
Ficus sycamorus	Abutilon hirtum
Ficus populifolia	Euphorbia cuneata
Dobera glabra	Acacia paolii
Hyphaene coriacea	Jatropha dichton
Balanites pedicellaris	Commiphora trothae
Berechemia discolor	Acacia mellifera
Balanites orbicularis	
Diospyros scabra	
Boscia coriacea	
Delanix elata	
Acacia eliator	

Source: Forestry Handbook for Primary School Teachers in Turkana District, 1988.

Most of the classification takes into consideration the importance of riverine forests. These categories account for 23% of the district's woody vegetation. In the dry season, riverine forests support 30% of all livestock in the district. Permit are needed to fell trees for building material, charcoal, and to clear areas for cultivation. The riverine forests are owned by families, and it has not been difficult to exercise a permit system in most cases.

One issue which has attracted the attention of the administration and Forest Department is that of concentrated settlement which requires more than the usual supply of wood products both for construction and energy. People need permits from the Forest Officer after a chief has concurred. Tree planting exercises have been targeted to those areas which have been denuded. Grazing is, as a matter of tradition, not allowed until trees are above browse height.

The system of issuing permits which are synonymous with licenses has its merits and demerits. While the system can check the destruction of trees in ecologically vulnerable areas, it can also discourage people from planting trees when they know that such trees will ultimately be subject to permission by the governments officers. This system has only been feasible in riverine woodlands and around settlement areas. In practice, there is very little monitoring in areas far from the settlements as forest guards and patrolmen are too few in number to do the policing.

The issue of charcoal burning has been an issue of concern to the administration for many years. Currently charcoal is not allowed to be exported from the district. A number of permits for charcoal burning are issued by the Forest Department however the consumption and supply of charcoal has not been determined. The last review in 1986 recommended survey of fuelwood and charcoal for Lodwar town. Such a survey could give the consumption trend and possibly the impact charcoal has in the wood catchment area of Lodwar town.

Burning of charcoal has certainly contributed to the deforestation of areas near settlement and urban areas. It is feared that despite the ban on charcoal export to other districts, some quantities still finds their way out of the district. Planting of trees has been made in the vicinity of urban and settlement areas. However the planting has been an expensive and difficult task. Some progress has been made in the course of planting an equivalent of 900,000 tree seedlings since 1984.

For many years natural vegetation will continue to be the main source of wood. Indeed the Turkana population of 200,000 needs about 280,000 m^3 of wood per annum. If dietary habits change, then for the assumed fuelwood demand of 40m^3 per ha per annum of 10 years rotation, an area of 70,000 ha needs to be planted (consumption rates based on the FAO report, 1984). Management of natural vegetation to increase its yield seems a sensible strategy. This is however rarely done due to shortage of staff and lack of site specific management plans.

Recommendations

Several of the following recommendations, which the mission believes to be appropriate, are restated from the 1986 Forestry Review (Ref. TRDP, 1986).

For the foreseeable future, natural vegetation will continue to provide the bulk of the wood requirement for the people and livestock. An inventory of such an important resource should be made.

A forestry policy and guideline on woody vegetation has been produced. The document is a step in the right direction. While waiting for approval of the draft policy guideline, site specific management plans for Katilu, Kakuma and Lokichoggio should be made. These management plans should serve as demonstration for other areas. The plans should have specific objectives, like for example increasing natural vegetation yield by a factor of two. Forestry policy and guideline document has produced the necessary local information on vegetation from their discussions with the local people.

There has been some experimental work on fencing off areas to indicate potential germination. The concept should be modified and applied in the field where paddocks should be delineated and active management of fodder and wood yield increment carried out. Some manipulation of thinning and selective cutting may have to be done.

Licensing policy should be modified to favour efficient wood conservation methods. For this reason houses made of mud blocks may be preferred to those using too much wood. Conservation of charcoal and fuelwood is a well known technology nowadays.

A survey of the trends in charcoal consumption for the next 5 years for Lodwar town should be undertaken. The study should include an estimate of present and future consumption, production levels and sources of supply.

KEFRI should incorporate its findings on efficient means of charcoal production in Forest Department courses in Turkana. Those who hold permits to burn charcoal should be encouraged to attend these courses.

5.2.2 Community Participation

Essentially there are three categories of tree ownership in the district: individuals, institutions and the community. The review mission noted many trees which have been planted in house compounds. These trees were planted and subsequently cared for by the individuals for shade, fodder and construction material. This was evident in the settlements.

A number of institutions have also planted trees in their compounds, most notably schools and churches. These institutions have been helped by the Forest Department, TRP or NGOs with tree nurseries.

The third category of trees ownership is the community. Trees have been planted in places such as Lodwar, Kakuma, Lokichoggio and Katilu irrigation scheme. The trees belong to the community simply because the land on which such trees are planted belong to the community. Otherwise such trees are planted with the initiative of Forest Department or any other NGO which wants to promote forestry.

In all such community forests, there has been community participation. However it should be stressed that there was no evidence of community participation in tree planting without some kind of reward in the form of wages, tree planting incentives or FFW. Where there was voluntary community participation, the situation was an exception rather than the rule. In fact the impression review mission got was that as far as the local people are concerned, such trees belonged to the organization which promoted tree planting.

It would appear that, however noble the idea of community participation is in forestry, people are willing to plant trees only if they can say that tree is "mine" rather than it is "ours". People protect trees only if they are paid or for fear of punishment rather than with the conviction that trees are beneficial to the community as a whole.

Individual tree planting has been done with or without immediate incentives. In such cases people are aware that all the benefits of such trees will accrue to them. Similarly institutions are able to plant trees because they can require their people to do the undertaking.

Community participation in natural regeneration does not require as much energy as that associated with tree planting. The complex system of tree ownership has been reported for Turkana (Ref. Barrow, 1987). Trees are protected along riverine and hilltops because individuals or the local community own the trees. Fear of destruction of the wood resource by other people is the driving force of community participation in protection. Where community values have broken down, like in the settlement schemes, wood resources have been destroyed at an alarming rate. In such cases artificial communities have been formed, and consequently traditional values have become subdued.

Recommendations

Community participation is a noble idea. The concept is akin to the "haram-bee" system which has been instrumental in the development phenomena in other sectors of the economy. Extension strategies should be geared towards persuading community participation in tree planting in some priority areas. Means of personal satisfaction of various members of the community should be devised. This is a challenge to forestry extension in communal lands.

Individual tree planting should by owners should be given more weight. In fact a system of imparting right of use/access to trees on communal land should be devised.

In the event that some natural vegetation will be gazetted active management by adjacent communities should be initiated on a system of sharing royalty from forest areas.

5.2.3 Training Needs

The training needs of the existing staff have been assessed under Staff Training (see Section 5.1.5). One issue which has a long-term implication on forestry development in the district is that of staff turnover. Staff are transferred routinely within and outside the district. This is on overall forestry practice which is not likely to be changed for any particular district.

A recommendation to restrain frequent transfer of staff has been made with the view to using the acquired practical experience for further development of forestry in the district. It should however be borne in mind that many forest officers may not wish to remain in the district for too long. Retaining them against their wishes would demoralize them and possibly cripple the forestry programme. There are only two qualified Turkana diploma foresters, one of whom is a woman now posted at KEFRI, Lodwar.

This raises the fundamental question of training enough Turkana people as front line extension staff. They have the advantage of speaking the local language and would not mind serving in the district for long periods of time. If these people are drawn from high school, they could be given special training at Lodwar which would allow them to climb the promotion ladder while at the same time serving at the locational and divisional levels. It is estimated that each location will need two such front line staff. Together with those at divisional level, a total of 66 extension staff of high school standard could be deployed usefully.

In addition to these front line staff, forest guards, patrolmen and nursery people will need vocational training to supplement the newly recruited category of staff. The on-going training of women, teachers, elders, NGOs and other opinion leaders can continue with the provision that such categories of people will occasionally have residential training to boost their morale even higher.

KEFRI has had a strong training programme for its staff nationally. In Lodwar, KEFRI would like to train staff at diploma level, BSc Forestry, MSc and PhD.

Scholarships are needed to send staff for further training both within and outside the country. Scholarships should be provided over the next 10 year period.

Recommendations

The Forestry Department staff should be strengthened by new local recruits to do front line extension. The recruits should be 'O' level and be able to speak Turkana. Each location should have two such officers.

The training of such recruits should be done in the district. On the job training should be supplemented with in-service training at Lodwar training centre.

The people should be trained along with the agricultural extension officers. Promotion opportunities should be provided to those extension officers.

Forest guards and patrolmen should also be trained to assist in extension and active management of the vegetation. They should supplement work being done by extension officers.

On the whole transport is an expensive item in forestry extension. The GOK should invest more in personnel who are willing to walk, ride a bicycle or a motorbike. Recruitment and training of such people to work at locational level will lead to sustainable forestry extension and management.

5.2.4 Impact on the Women's Situation

Women are mainly responsible for the collection of firewood and fruit, construction of homes, fencing of gardens and livestock corrals and making household utensils and containers. With increased sedentarization and the concomitant decrease in the woody vegetation, women must go further away from their homestead in order to acquire the needed tree products. Charcoal burning is one of the few economic activities women outside of the pastoral sector can engage in.

Many of the forestry sectors activities directly address these issues. Tree planting is one method, but on its own it would only provide a temporary solution. More important are the extension activities, especially the locational forestry seminars. One aspect of the seminars which is particularly pertinent to women is the discussion on woody management, which includes such issues as charcoal production, timber for construction and other uses, and fencing. Demonstrations of alternative methods or materials, such as earth kilns for charcoal, mud bricks for building, and economical `jikos' or charcoal stoves are also part of the course curriculum.

Women's participation in the seminars has been good. Out of a total attendance figure for the district of 3,041 individuals, women comprised 22% of the participants, although the range varied widely by area - from a low of 5% in Turkwel division to a high of 49% in Kakuma division.

Seminars are only one forum used for the extension activities; others include barazas or meetings, homes, individuals, tree nurseries, schools, and churches.

Women's groups, unlike schools, have not been specifically targeted; only 8 women's groups in the district have been used as a forum by the forestry sector (Sangnes, personal communication), representing less than 1% of the forums where respondents, who were included in a forestry extension impact survey, had heard forestry issues discussed (Barrow, 1989). **Women's groups should be considered for extension activities by the forestry sector in the same way other groups of people are reached.**

The forestry sector (KEFRI) has one female professional staff member. She is a Turkana, who began work during the teams field period. Women hold only 7% of the insubordinate staff positions (such as workers in the tree nurseries, seed gatherers, etc.) which deal directly with forestry. Yet women have demonstrated an interest by their level of participation in seminars and by their willingness to talk to the review team during our field visits. **Women should be given more opportunities to work within the forestry sector in salaried positions. They would then have more first hand experience with the different seeds, germination and growth rates, water usage patterns, etc., of the trees.**

5.2.5 Distribution and Accessibility of Services

Currently there are seven divisional forest officers who are distributed in all the divisions except the newly formed Lokichoggio Division. There are plans to post a forest officer to Lokichoggio as soon as facilities are ready.

Of necessity most of the services have been concentrated near the urban centres and the settlement schemes along the Turkwel, Wei Wei and Kerio rivers. Tree planting activities and extension services have also concentrated on the settlements in other parts of the district.

Forestry services have essentially been in the form of extension which has not adequately reached some of the more distant areas such as the western borders of the district where only the cattle herders go during the dry season. Elsewhere in the country, forestry services have been available even though on a limited scale due to transport problems and shortage of staff.

Recommendations

More extension staff should be hired and deployed in all locations for efficient extension service.

Settlement areas should continue getting more forestry services to avert resource degradation associated with high wood demand in such areas.

5.2.6 Human and Capital Resources Available to Sustain the Services

The district has two senior forestry officers and seven foresters. The current number of officers is too small to be able to cope sufficiently with intensive forest conservation and extension. In addition, the Forest Department has 28 forest guards, 32 patrolmen and 128 subordinate staff (nine of them women) and 234 casuals. The limited number of staff means that extension work and tree planting can only be done on a fairly low level. This is in fact what has been happening in forestry.

KEFRI has only three staff members, one research assistant and two technologists. The team is maintaining research trials which were initiated by the Forest Department. A high level of research cannot be undertaken until KEFRI staff are trained.

Capital resources have been provided by both the government and the donors. Over the last three years TRDP financial input to the Forest Department and KEFRI over the last three years is presented in Table 5.5 below.

Table 5.5 - TRDP FINANCIAL INPUTS INTO THE FOREST DEPARTMENT AND KEFRI, 1987 - 1990.

Year	Forest Department	KEFRI
1987/88	Ksh 3,700,000	Ksh 1,569,000
1988/89	Ksh 3,900,000	Ksh 1,790,000
1989/90	Ksh 2,037,000	Ksh 915,000
Total	Ksh 9,637,000	Ksh 4,274,000

Source: TRDP Forestry Sector: Project Status Summary Report, Phases I, II, and III.

During the third phase, financial inputs to the Forest Department were reduced from Ksh 3.9 million to Ksh 2.0 million, i.e. a 48 per cent reduction in funds. The main issue of concern to the Forest Department was that the TRDP reduction in 1989/90 recurrent vote has left budget line items on night-out allowances, transport and stationery purchases virtually with no money. The situation has been made worse by the fact that in 1989/90, the ASAL vote 738 was allocated only Ksh 30,000 as opposed to the previous year's allocation of Ksh 900,000 (DFO Lodwar, personal communication).

5.2.7 Follow-Up on the Recommendations Made by the Previous NORAD Review Mission

Source: TRDP, Forestry Development Project 1984/85 - 1986/87: Report of the Review Mission, October 1986.

1. Priority should be given to the management and conservation of riverine resources near urban and larger settlements.
   ACTION: BEING DONE ON A LIMITED SCALE

2. An inventory of forest resources in Turkana District, particularly of the riverine forests, is required. KALRES is currently undertaking a survey of vegetation status and dynamics in these areas. The Forestry Department should liaise with KALRES to ensure that the information being collected will be useful to them and to explore ways of speeding up the exercise and making it as comprehensive as possible.
   COMMENT: SEE SECTION 5.1.6 FOR REVIEW MISSION'S RECOMMENDATION ON THIS ISSUE
   ACTION: NOT DONE

3. A survey should be undertaken to establish the trend in charcoal consumption and supply in Lodwar town over the next five years. The exercise should include an estimate of present consumption, supply and source of supply.
   COMMENT: SEE SECTION 5.2.1 FOR REVIEW MISSION'S RECOMMENDATION ON THIS ISSUE
   ACTION: NOT DONE.

4. Fuelwood plantation should be established at strategic places in urban settlements particularly Lodwar, Kakuma and Katilu. In such cases, local authorities could own the plantations. Fuelwood supply should be taken into consideration at the time of planning the settlements.
ACTION: NOT DONE.

5. Efficient means of charcoal production should be introduced for those who hold permits to burn charcoal. Fuelwood and charcoal should only be taken from dead wood.
ACTION: NOT DONE.

6. The introduction of rotational grazing should be explored and there should be close cooperation between Forestry and Range Management Officers to achieve this and in carrying out the work of conservation and management in general.
ACTION: NOT DONE

7. Tree planting should be integrated with crop production in irrigation schemes and there should be closer cooperation between the Forestry and Agricultural Departments.
ACTION: IMPLEMENTED.

8. Prominent sites on bare hillsides should be fenced off to allow natural regeneration to take place. Reseeding should be done if necessary. Such sites would serve as demonstrations of what can be achieved.
ACTION: IMPLEMENTED ON A SMALL-SCALE.

9. The gazettement of Loima Hills as a forest reserve should be followed up.
COMMENT: SEE SECTION 5.1.6 FOR REVIEW MISSION'S RECOMMENDATION ON THIS ISSUE
ACTION: NOT DONE

10. The Forestry Department should take more control over what is grown. TRP, NGOs and other agencies should be encouraged to seek advice from the Forestry Department on the best species to plant. Planning sessions should be held between all those who undertake tree planting to discuss their needs and the most appropriate species. Nurserymen should also be able to advise customers on the best species for specific uses and to suit the conditions in the area.
ACTION: DONE, BUT IMPLEMENTATION HAS BEEN SLOW.

11. Planning sessions should also be used to improve the timing of nursery operations. three to four months is a reasonable period in which to raise most seedlings.
ACTION: IMPLEMENTED.

12. All nurseries should mix nursery soil with well cured goat manure and use 20cm long containers (black tubes, 10cm x 20cm long with a closed, perforated base) to improve the quality of nursery seedlings.
COMMENT: THE REVIEW THOUGHT THAT SUCH A MOVE WOULD INCREASE NURSERY COSTS WITHOUT NECESSARILY INCREASING SEEDLING SURVIVAL RATES
ACTION: NOT DONE

13. The Ministry of Water Development is reported to be planning to establish tree nurseries in the district. The Forestry Department should take this opportunity to co-opt this Ministry to the District Forestry Development Committee in order to promote co-ordination and the improvement of water supplies to nurseries.
ACTION: NOT DONE

14. Annual assessments should be made of the survival rate of trees. Trees once planted must be protected. Trees that are not browsed during their early years such as Prosopis chilensis should be encouraged in areas where protection is a problem.
ACTION: NOT DONE

15. The Incentive Tree Planting Scheme should continue. Incentive schemes should be geared to the most needy people and based on the principle of ownership of the trees by the people. Trees which are most useful to people should be planted.
COMMENT: TEAM AGREES WITH ACTION TAKEN
ACTION: NOT DONE, SCHEME HAS BEEN DISCONTINUED

16. Alternative incentives to encourage the planting of trees once the FFW programme is phased out should be introduced. It is suggested that the growing of food crops in micro-catchments should be investigated as a possible incentive.
ACTION: NOT DONE

17. The Forestry Department should demonstrate the benefits of planting trees by distributing dry season fodder in periods of scarcity. The Prosopis trees at Katilu produce large quantities of pods which could be collected and stored at Lodwar for this purpose.
ACTION: IMPLEMENTED ON A TRIAL BASIS

18. Planting sites should be located adjacent to settlements and carefully selected to take account of potential changes in land use once the settlements grow. Consideration should be given to encouraging the planting of small, privately owned woodlots.
ACTION: IMPLEMENTED.

19. The Forestry Department should provide supervisory assistance to TRP and other organizations in their planting activities with the aim of improving the survival rate.
ACTION: DONE

20. That KEFRI should take over responsibility for research activities in the district. Research programmes could be undertaken jointly, with KEFRI specialising in species selection, development of planting and harvesting systems, and KALRES taking responsibility for long-term monitoring of vegetation and the management of range resources.
ACTION: DONE

21. The planting techniques and species trials should continue. They should be well maintained, assessed regularly and repeated for several years to overcome the effects of good and bad years. In future trials, the species to be tested should be limited to 10 after elimination of the non-starters. More emphasis should be given to local multi-purpose species and to ways of improving the cost effectiveness of micro-catchments.
ACTION: DONE

22. The Dobera glabra regeneration trial should be replicated in other areas. various soil working techniques to improve germination and growth should be tried. Such regeneration trials should also be used as demonstration areas.
ACTION: DONE

23. Research into Date Palm husbandry should be intensified and further systematic introduction of the most appropriate species for the area should be made from Pakistan.
COMMENT: THE PROJECT IS NOW UNDER THE MINISTRY OF AGRICULTURE
ACTION: NOT DONE

24. Research should be initiated into the regeneration and harvesting of the Doum Palm.
ACTION: DONE

25. Extension work should encourage involvement and a feeling of continuing responsibility for tree conservation and production among the local community.
ACTION: DONE

26. The Forestry Department should prepare a plan of action indicating priority target groups, methods to be used and resources required to implement an effective extension service.
ACTION: PARTIALLY DONE

27. One member of the staff at the district level should be given the specific responsibility for planning, organizing, and monitoring extension activities and for coordinating with other agencies concerned with extension work in the district.
ACTION: NOT DONE

28. The training courses for all opinion leaders should be continued and developed. Target groups should include tribal elders, women, political, social and religious leaders. the courses for teachers should also continue and emphasis should be given to encouraging the attendance of headmasters and school administrators. To reinforce awareness of forestry issues and to provide further information, refresher courses should also be given.
ACTION: DONE

29. The Forestry Department should liaise with other Government Departments and development agencies in the district in order to ensure their assistance in achieving the objectives of tree conservation and production. It will be necessary for the Forestry Department to take the initiative and approach the officials concerned to put the case for collaboration.
ACTION: NOT DONE

30. TRP's proposal that a Forester be attached to TRP with the specific task of improving day to day co-ordination at the district level should be implemented. A further improvement to co-ordination with TRP at the district level would be achieved if meetings of the DFDC were held on a more regular basis.
ACTION: NOT DONE

31. The Review Mission supports the proposal for a TRP planting team to be trained and supervised by the Forestry Department.
ACTION: NOT DONE

32. The Forestry Department should prepare a well considered list of projects to be handled by TRP in future FFW programmes. For example, these could include the development of fuelwood plantations, the proposals for which should clearly specify the Department's priorities for their location.
ACTION: PARTIALLY DONE

33. The Forestry Department should prepare technical advise on the choice of species to be planted and planting techniques for use by the TRP and other agencies.
ACTION: DONE

34. Co-ordination between the Forestry and Range Management Departments should be strengthened. This could be achieved by broadening the role of the DFDC to include the Range Management Department. A "District Forestry and Range Management Development Committee" would improve co-ordination at the district level and ensure that the links between the two sectors are formalised.
ACTION: NOT DONE

35. Two additional Foresters should be employed.
ACTION: DONE

36. The vacant positions for Forest Guards should be filled as soon as possible and the currently employed patrolmen should be trained and deployed as extension agents.
ACTION: NOT DONE

37. Strengthening of support staff should be the long-term objective.
ACTION: DONE

38. The people employed by NORAD a casual staff should be considered for absorption by the Forestry Department when the current project ends.
ACTION: THEY HAVE NOT BEEN ABSORBED BY THE FOREST DEPARTMENT

39. Facilities should be provided in Turkwel and Lokori within the short-term plan.
ACTION: DONE

40. Facilities for Loima Hill Forest Station should be include in the long-term plan.
COMMENT: THIS SHOULD BE LINKED WITH THE GAZETTEMENT OF THE LOIMA HILLS.
ACTION: NOT DONE

41. Four, four wheel drive vehicles should be purchased over the three year
period.
COMMENT: THE VEHICLES HAVE NOT BEEN DELIVERED TO TURKANA DUE TO CLEARANCE FORMALITIES.
ACTION: PURCHASED.

42. The Forestry Department should consider the most cost effective methods of deploying transport, fuel and other services in the special circumstances of a vast and relatively undeveloped district.
COMMENT: BICYCLES WILL SOON BE INTRODUCED
ACTION: CONSIDERED

43. In-service training for Forestry Department staff especially in extension methods and techniques should be increased.
ACTION: NOT DONE

44. The curricula of the forestry College and Moi University should include topics related to arid lands forestry and in particular conservation and management.
ACTION: NOT DONE

45. Professional Foresters with good academic and practical backgrounds should be selected for post graduate training and for short study tours to countries which offer appropriate education in arid lands forestry.
COMMENT: DFO HAS BEEN TO ARIZONA FOR DRYLAND AFFORESTATION TRAINING.
ACTION: PARTIALLY DONE

46. To improve the effectiveness of extension work, local people should be selected for training in forestry wherever possible.
ACTION: PARTIALLY DONE

CHAPTER 6 - HOW TRDP AGRICULTURE AND FORESTRY ACTIVITIES RELATE TO NATIONAL AND DISTRICT OBJECTIVES

6.1 NATIONAL OBJECTIVES

Demography

National objectives can only be understood in the context of the demographics of the ASALs. Five million Kenyans were living in the ASALs according to the 1979 Census. Their number is increasing fast, and their growth rate is estimated as being higher than the national average of 4% per annum (Ref. IFAD, 1988). There is also in-migration of people into the ASAL areas from the wetter regions of the country. In 1979 it was estimated that there were 1 million pastoralists in Kenya, of whom 142,702 were in Turkana (Ref. TDDP)

Resource Base

The ASALs are characterised by erratic rainfall and high intensity storms when the rain comes. Thus crop agriculture is always highly problematic. The soils of the ASALs are generally poor, subject to compaction and water-logging. Rivers are usually dry with flash floods occurring after rainfall. Surface waters are few and of dubious quality. Land is not legally demarcated and thus cannot be used to support non-agricultural investment in the national credit system, which is based on land registration. Further, few industries are located in ASAL areas, mainly because the water, road, and communications infrastructure is poor. In Zones Vl and Vll of the ASALs, as in Turkana, pastoralism is the dominant way of life. In conjunction with pastoralism, limited shifting cultivation is practiced in pockets (Ref. IFAD, 1988).

Past Limitations on ASAL Development

Past development planning has seen the ASALs as low potential areas in developmental terms. This view is becoming less tenable as the key resource of the ASALs, i.e. livestock, is of prime national importance and a commodity in high demand. The past strategies and practices of sectoral development planning, without any effective institutional base in the communities, has limited the effectiveness of the little investment in the ASALs. Thus, it is increasingly clear that the development activities which are likely to succeed in the ASALs are those which cover small areas that are managed by the owners of the resources; areas where communities are aware of the social and resource stresses and the distribution of benefits is clear (Ref. IFAD, 1988).

These development management issues suggest also that the state institutions are to be seen as facilitators of development rather than the drivers of development. It is clear that the nation itself and its donor allies do not have the resources to undertake each and every development activity. Even if external institutions had the resources to develop all ASALs, it is not desirable to alienate communities from development processes; such a strategy would create a dependency which is non-developmental.

6.1.1 Future ASAL Development Objectives

The National Development Plan 1989-1993 (NDP) states that the premier objective of all national development activities is to make development sustainable. This is no less true for the ASALs where such an objective can only be attained if community, district and national activities are individually sustainable.

The second objective is to improve resource management both in terms of the physical resources and the institutional organization for their utilization, with particular emphasis on the increase in ground cover. This was initially outlined in Sessional Paper No. 1 of 1986, but has also been emphasised in the current Development Plan. It is seen as a major activity in the IFAD Report cited above. The assumption was that the sectoral activities in forestry, agriculture and livestock production would address the issue particularly in ASAL districts where technical manpower is inadequate and distances are vast, thereby resulting in very high operating costs which are not sustainable.

The third objective is to increase food, fodder and fuel production by introducing new water-harvesting, tree planting and protection technologies and committing research to finding solutions to ASAL production problems. In fields where ASALs have a comparative advantage, such as in livestock production, new development activities have to be introduced to support these important sectors. For example, livestock production has to be supplemented by the production of fodder which can be incorporated into pastoral systems most efficaciously through forestry activities.

The fourth objective is to increase local incomes both by pricing mechanisms and by non-agricultural employment.

The fifth objective is to improve access to social services.

The sixth and last objective is to strengthen district and local community institutional capacities to manage development within the context of the District Focus Strategy for Rural Development.

The national objectives are to be translated into specific sector activities. For the purposes of this review, the key activities for development in Turkana, which fit into the national objectives are:

a. Support to improvements in traditional rainfed agriculture;
b. Support to general forestry and fodder production in particular;
c. Diversification of agricultural production;
d. Research and extension in new crops like dates;
e. Institutional support to strengthen the District Focus capacity.

6.2 DISTRICT PLAN OBJECTIVES

The past plan strategy for the district gave emphasis to irrigation and large-scale water-harvesting activities, which were necessary then for absorbing the very large numbers of people needing famine relief. This seems to have developed into a new ecologically realistic, and therefore sustainable, strategy. It is dependent upon rainfed agriculture, as opposed to the non-performing irrigation systems of the past.

Thus the current Turkana Development Plan (1989-1993) (TDDP) states inter alia:

"In Turkana District, which is an arid district, livestock is the basis of the economy" (Ref. TDDP, pp57) for "Nomadic pastoralism is the mainstay of the people and the most rational use of the ecologically fragile ecology" (Ref. TDDP, pp79).

It is estimated that pastoralism which was absorbing 55% of the labour force in 1987 will only be marginally reduced before 1993 when it will be absorbing 52% of the labour force (Ref. TDDP pp 39). Agriculture will only marginally improve its absorptive capacity by an increase from 24.5% to 26%.

The Plan further recognises that it will not be possible to absorb all the labour force in the pastoral economy and thus "agriculture is expected to play an important role in the attainment of the district goal of being self-sufficient in food" (Ref. TDDP, pp79).

The specific agricultural activities envisaged by the district include crop production of drought resistant crops like sorghum, cow peas and green grams, dates and other fruit and vegetables. Most of these would be grown under rainfed water-harvesting systems since "the rivers are also subject to flooding and frequent changes of river course, which is a threat to the continued operation of the established irrigation schemes" (Ref. TDDP, pp85) and thus "no major irrigation expansion is anticipated" (Ref. TDDP, pp85). There is, however, a proposal to establish a 600 ha irrigation project between Twin Island and Kaputir to settle 1,000 families for "This area has the highest probability of controlled flood and assured water supply for irrigation and triple cropping per annum"(Ref. TDDP, pp85).

In summary, then, the district strategy is to emphasize livestock production and to expand agricultural crop production through dryland farming by concentrating resources "in introducing water harvesting in traditional gardens to improve water retention and its efficient utilization by the crops, concentrating on small water harvesting structures that can be constructed and maintained by family units and which are socially acceptable to the local community" (Ref. TDDP, pp86).

6.3 FOOD AID

The mission believes that the district has evolved a sound conception of food-for-work. This is found in the current District Development Plan which states that the district "shall scale down on large spate diversion works but continue vetting sites and keeping the projects 'on shelf' should the need arise out of a large 'food for work' labour force" (Ref. TDDP, pp 86).

As the District Commissioner pointed out to the review mission, food aid has been used in Turkana for all sorts of activities in the past. For purposes of this review, it is noted that food aid has the capacity to disturb the traditional institutions and introduce new structures, such as co-operatives and water users associations. Labour is taken way from those communities where farmers are supposed to increasingly take on responsibilities related to construction of water harvesting structures on their individual holdings and on irrigation schemes where they are supposed to take on maintenance work. Furthermore, food aid introduces tastes which are not sustainable. Finally food aid distorts local production systems.

As the project attempts to service rainfed agriculture, forestry planting activities and irrigated agriculture, large FFW activities should not take place within the proximity of project activities as they would have negative impacts on desired sustainable practices.

Since large amounts of food aid are still to be pumped into the district through other projects, there may be occasions when the project can identify opportunities for using it in needed development activity. The planning will have to be very carefully considered by project staff so that the food does not destroy the possibility of farmers continuing their own development. More specifically food aid should not destroy the marketing of local production.

6.4 TRADITIONAL RESOURCE MANAGEMENT SYSTEMS

The Turkana have traditionally managed their resources in a way that has been environmentally sound. Water and land (grazing and cultivation) rights are recognized by the Turkana, whose management system is oriented around their social organization.

There are 19 geographically defined sections or 'ekitela' in Turkana District. Within each 'ekitela' are a number of 'adakars' or grazing associations, i.e. pastoralists who move in the same general pattern and exploit the same basic resources. Ownership rights in a given area belong in general to members of the same 'adakar' but in practice are held by individual families in the 'ere' or wet season grazing area. The 'ere' is where the Turkana plant their traditional rainfed gardens and where they have their 'ekwars.'

Implementation of projects, such as water harvesting improvements, introduction of desert crops, etc., should go through the local management systems of 'adakar,' or 'ere.'

CHAPTER 7 - ASSESSMENT OF THE ROLES OF THE THREE MAIN GOVERNMENT INSTITUTIONS IN THE DEVELOPMENT OF THE DISTRICT

7.1 THE ROLE OF THE MINISTRY OF AGRICULTURE IN TURKANA DISTRICT

The Turkana District Plan is an integral part of the National Development Plan which has persistently and consistently maintained that agriculture is the mainstay of the Kenyan economy and will remain so for a long time to come. The National Plans have always entrusted the agriculture sector, among others:

(a) to provide food security and self-sufficiency in a broad range of foodstuff to feed her Nation's Population;

(b) to alleviate poverty via the creation of employment and income-generating opportunities;

(c) to conserve the environment for sustained use;

(d) to form a base for the accelerated growth of the other sectors of the economy and to offer extension services on how to achieve these objectives.

The MOA has over the past 20 years attempted to attain these objectives in Turkana and is pursuing them relentlessly.

In the area of food security and self-sufficiency, the Ministry has promoted the establishment of irrigation schemes and dryland farming over the past twenty years with the other aim of resettling and offering viable alternatives to the nomadic pastoralists. However, the viability of these irrigation schemes has been problematic due to the nature of the district's rivers which keep on changing course and contain either too much or too little water for irrigation. For figures on the present and planned irrigation coverage in the district, see Section 3.2

Irrigation in Turkana has not been very successful, and so attention has been diverted to dryland rainfed farming. The use of water-harvesting techniques for dryland farming has been started. The MOA has not intensified extension into dryland farming due to lack of appropriate extension packages. Emphasis has been shifted to rainfed farming because production on the schemes meets only 1.4% of the district grain requirements.

In attempts to provide for foreign exchange earnings from Turkana, the MOA has identified several desert crops which could be promoted for export and for the provision of raw materials for the desert crop industries in Kenya. These plants include dates, jojoba, guayule, guar, Euphorbia candelabrum and buffalo gourds (for more details on these crops, see Section 4.2).

7.2 THE ROLE OF THE FOREST DEPARTMENT IN TURKANA DISTRICT

Nomadic pastoralism still remains the predominant way of life in Turkana District. Therefore, the economic development of the district as such depends on livestock - cattle, sheep and goats, camels and donkeys. Goats and camels rely to a large extent on trees for their food. The Turkana people are now changing their life-style and are settling in different areas of the district. As these settled areas grow, people will become increasingly dependent on trees, thereby increasing the demand for fuelwood, food and building materials. The Forest Department's role is essentially to ensure the conservation and management of existing trees, and also to plant species suitable to this area for increased production.

For this role to be carried out effectively, inter-agency liaison is of paramount importance, and the Forest Department has developed closer ties with a number of agencies involved in related developmental aspects in this area. These include:

- The Ministry of Agriculture
- The Department of Range Management, Ministry of Livestock Development
- The Turkana Rural Development Project
- The Ministry of Water
- The local authorities
- Other NGOs.

Through cooperation between the TRP and the Forest department, the FFW programme has been a means to carry out forestry activities. These forestry activities are beneficial to the local community because trees give them food, fodder for their livestock, fuelwood and building materials.

Under the FFW programme, nurseries were developed, micro-catchments constructed and trees planted. The programme therefore is of considerable benefit to the Forest Department who does not have enough funds to conduct these activities on such a large-scale.

The MOA undertakes crop production in irrigation schemes and in micro-catchments. The Forest Department plants trees here to stabilize the structures, and to increase production. There is therefore continued inter-ministerial co-ordination at the district level. This is mainly maintained through the District Development Committee.

In summary the Forest Department is responsible for:

(i) the conservation and management of the district's woody and range resources;

(ii) the extension of their services to the local community;

(iii) planting trees in the district;

(iv) the establishment of nurseries at suitable central areas in the district for increased seedling production;

(v) undertaking research to find the best species, the best ways to plant them and the best way to manage and conserve them.

7.3 KEFRI

The Emergence of KEFRI

The recognition of a need to institute the forestry research and development programmes dates back to the 1930`s. In 1983 recommendations were made by the national workshop on strengthening Forestry Research. KEFRI was finally established as a statutory research institution in 1986, under the recommendations of the National Council for Science and Technology, to promote and implement basic and applied forestry research and development programmes.

The Role of Forestry Research in Turkana

Forestry research is extremely important in generating improved technologies necessary for enhanced forest productivity, sustainable management of the forest resources and in coping with future socio-economic developments. Socio-economic challenges are expected to be more difficult to surmount due to high population growth rates, a small high-potential forest land base and the continuing pressure on forests for agriculture and settlement. In the past, research programmes have made significant contributions to forest and watershed management etc. Given the natural role of forests in the national economy and in total land use, forestry research has greater potential in shaping the future.

Important breakthroughs in the past include species selection and propagation for a wide range of ecological sites found in the district, pest and disease management imperatives, the characterization of properties of some of indigenous and exotic tree and shrub species grown in Turkana including minor forest products (gums and resins), and raising and managing plants for fodder production. Information is now available on the design and sizes of, and species planted in micro-catchments throughout the district. These technologies constitute the tenets of forest extension messages currently being delivered, both formally and informally, to residents of Turkana District. The ever-increasing demand for goods and services and attendant pressures on forest resources has widened the horizons of the research agenda, with the concomitant growing demand for more accurate information.

Recently, the government employed different strategies for improving wood production and services, including popularizing social forestry, forging increased per hectare and unit labour yields, expanding the forest land-base into the arid and semi-arid areas and managing indigenous forests on a sustainable basis. To achieve this goal, the Dryland Silviculture Division has set up a station in Turkana.

Therefore, KEFRI's Turkana mandate should not only be to serve as a district centre, but also fit in as a regional station in the national network for dryland forestry research . KEFRI should consider therefore, upgrading this role to a national level.

Within the framework of the national dryland forestry research network, research is carried out in different stations focusing on the development of dryland afforestation systems. The Dryland Silviculture programme covers:

i) Site preparation, raising of planting stock, tending of planted trees and management of natural vegetation. This is based on the recognition, that nursery practices in ASALs are different from those employed in the high potential areas.

ii) Undertaking species and provenance trials in representative sites.

iii) Studying the effect of browsing animals on the establishment of planted seedlings and seedlings arising from natural regeneration. Available results show that some species require total protection from browsing animals while others may require animals to facilitate their germination and development.

iv) Management of riverine vegetation and catchments in ASALS

v) Management of irrigated plantations

vi) Evaluation of selected Australian hardwoods for woodfuel and for integration in agroforestry systems.

Medium- and Long-Term Priorities

To address key issues, KEFRI's goals in the district are to furnish the essential introduction to the foresters, to develop models for future demand and supply of the wood and wood industries, and to take due cognizance of the relationship between biological components of the production system and to assess how they are influenced by socio-economic imperatives. These goals are at the heart of KEFRI's tasks, and it is realised that it would be difficult to accomplish them without KEFRI's considerable scientific and technological capacities. Capacity building and raising the status of the Turkana station to national level therefore becomes an important functional objective for the management of the station.

It is noted further that the multiplicity of purposes involved in setting priorities must be translated into strategic plans for the implemention of a core programme in line with the national planning guidelines; the promotion of technologies; and the creation of wealth and employment. This approach recognises the benefit of the multi-disciplinary approach for research and development as well as the functional utility of interactive linkages with other departments/institutions and their extension services. Indeed the extension services are important links in the chain of events which start with the identification of a reforestation manager and his users' problems and constraints, and continue through research, development and technological enhancement. The researcher, the reforestation manager, the forest industrialist, the extensionist and the tree planter must work as joint partners in development.

CHAPTER 8 - REVIEW OF THE ROLE OF OTHER GOVERNMENTAL AND NON-GOVERNMENTAL ORGANIZATIONS INVOLVED IN THE TWO SECTORS, AND AN ASSESSMENT OF THE POSITION OF TRDP ACTIVITIES IN RELATION TO OTHER PROGRAMMES AND SOURCES OF FUNDS

8.1 INTRODUCTION

Several NGOs and other governmental organizations are involved in forestry and agricultural activities in Turkana. A brief description of each organization and their relationship to the TRDP are presented below.

8.2 AFRICAN INLAND CHURCH (AIC)

The African Inland Church is a protestant church organization which has been involved in the health, education and agriculture sectors, and to a small degree in the livestock sector, of the district.

The organization was the implementor in the construction and formation of the irrigation scheme at Morulem; they provided some input into the Lokwi and Lotubae schemes. Initially, funds and technical personnel were provided by the Church. Currently the AIC is providing no input, neither financial nor technical, into the scheme. The MOA, through STAESU, is responsible for overall extension including operation and maintenance.

8.3 DIOCESE OF LODWAR

The Catholic Diocese of Lodwar has been in Turkana District since 1961. They are primarily involved in the health and education sectors, but have also been concerned with agriculture to a lesser extent.

The Diocese of Lodwar started the irrigation schemes at Julluk and Nakwamoru. All construction was funded by them. The MOA, through STAESU, is currently handling the operation and maintenance of the schemes; the Diocese of Lodwar's current inputs into the schemes is in the form of a subsidizing the machinery, they no longer provide any technical or direct financial inputs.

8.4 KERIO VALLEY DEVELOPMENT AUTHORITY (KVDA)

The objectives of the KVDA are essentially concerned with the promotion of socio-economic development in Baringo, Turkana, West Pokot and Samburu Districts.

The KVDA has a tree nursery at Kainuk, where they have been involved in tree planting activities. KVDA plans to put 3,500 ha of riverine area along the Turkwel river under irrigated cultivation during the 1989-1993 plan period (DDP).

8.5 OXFAM

OXFAM is a non-governmental organization which has been involved in the livestock, forestry and agricultural sectors of the district since early 1985.

OXFAM seconded a forester to the TRDP to conduct normal forestry activities, set up browse and fodder trials, and take over the date palm project in Turkwel

division. In 1988, the different activities were turned over to the institutions concerned: browse trials to KEFRI, date palm project to the MOA and normal forestry activities to the Forest Department.

The technical expert was provided by OXFAM, TRDP supplied the funding.

In the agricultural sector, OXFAM is involved in water-harvesting activities in Lokitaung division. Improved gardens, using draught animals, water-harvesting techniques and community participation, have to date been developed near Lowarengak, Lokitaung, Kachoda and Kaling.

The Lokitaung project is coordinated with the MOA. There is some collaboration with TRP, which provides the small amount of maize used in the FFW; the technical adviser was seconded from Intermediate Technology and Development Group (ITDG); all other costs are provided by OXFAM (Cullis and Watson, 1989).

8.6 REFORMED CHURCH OF EAST AFRICA (RCEA)

The RCEA is a Dutch church organization, which has been active in Lokichar, Katilu, and Loyapat. Their main sectoral activities have been concerned with health and education, but at Loyapat they became involved in agriculture.

Loyapat was initiated by the RCEA and they provided the financial support during the construction phase. Technical back-up was supplied by the MOA from Katilu. The RCEA continued financial input for operation and maintenance until 1985. Currently, the MOA is responsible for all operation and maintenance.

8.7 TURKANA REHABILITATION PROJECT (TRP)

TRP was created in 1980 as part of a bilateral agreement between the Government of Kenya and the Netherlands/EEC. The project was initially devised to provide immediate supplies for famine relief and to implement a 5-year rehabilitation programme based on FFW supplied by the WFP. The programme is currently directed at maintaining a food aid delivery system and in providing an infrastructure, which includes the TDCPU and Mobile Extension Team, to minimize the district's vulnerability to drought. TRP is involved in the health, livestock, forestry and agriculture sectors in the district.

TRP's activities in the forestry sector have centered around tree planting. For this activity a close collaboration exists between the forestry department and TRP. The seedlings in the tree nurseries are funded by TRP. The forestry department, which runs the tree nurseries, then supplies the trees from their nurseries to TRP to be planted in the micro-catchments constructed on the FFW programme. The forestry department provides technical advice on designs, maintenance procedures, and species of trees best suited for a given location. Technical advice was provided to TRP when they planted trees on the canal system at Kalemenyang. TRP provides food to employ casuals in the tree nurseries when there is a demand for increased production.

TRP's agricultural activities have been concerned with both water-harvesting and irrigation. The water-harvesting programme has concentrated on North Turkana, while the irrigation projects have been located in Central and South Turkana. TRP and the MOA both hold their extension courses by inviting each other to be facilitators.

With the exception of the intake at Lokwi/Lotubae, TRDP (STAESU) has had no direct inputs of funds into the TRP agricultural programme. The MOA provides technical back-up and extension work; all other costs are covered by the TRP programme.

8.8 TURKANA RESOURCE EVALUATION AND MONITORING UNIT (TREMU)

TREMU is a NORAD/UNESCO funded project, which started in Turkana District three years ago. The project's three main roles as part of UNESCO's Man and the Biosphere Programme (MAB) are scientific research, assistance to planners and the building of a national capacity (training). The scientific components include range and riverine ecology, livestock ecology and human ecology studies.

TREMU has collaborated with the forestry sector in two main ways. It has provided some of its research findings to the forestry sector, such as the effects of wildfire on riverine vegetation. TRDP has been able to use these findings to produce simple abstracts which have then been distributed to the forestry extension staff.

Since 1985 the TRDP, through KEFRI, has funded a one-week practical course for Moi University's second-year forestry students. As part of the programme, one day is devoted to practical work. During this day, students meet the TREMU team, discuss the research project and methodologies involved, and participate in the field at the TREMU trial sites by taking measurements, making identifications, etc.

CHAPTER 9 - VIABILITY OF PAST AND FUTURE OBJECTIVES, STRATEGIES AND IMPACTS

Past conception of the pathway to the development of Turkana society has had negative impacts on the objectives, strategies and, therefore, on the outputs. As early as the FAO period in the late sixties, it was assumed that Turkana society would move away from its pastoral base (see Section 1.4). Thus irrigation and fishing activities were seen as strategies for ensuring self-sufficiency to those who had been forced out of the pastoral economy. These interventions were aimed at assuring the destitute in Turkana some niche. Objectives and strategies were formulated within the context of a future where increasing numbers of Turkanas would function outside the pastoral society.

Similarly, it was assumed that as the Turkana people were not familiar with the new production systems being introduced, i.e. irrigation and large-scale fishing, the technical personnel would have to be supplied from outside the district.

Experience, since the onset of major development interventions in the late sixties, has shown that even in the worst of times the Turkana still depend heavily on pastoralism; from a production point of view, there is always some production from the livestock sector. It is pertinent to note here that the Turkana have had a tradition of fishing and cultivation. By the nature of the physical environment these had to be site specific and supplemental. But at no time have the previous conceptions of irrigation and fishing been able to support any significant numbers of people.

Experience of the past twenty years suggests that income made through irrigation and fishing activities is reinvested in livestock. More significantly, income from other activities, such as trading, salaried employment, etc., also goes back into the pastoral sector.

Yet perhaps the worst mistake in the development pathways of the past was the assumption that Turkana society operated without the organizational and institutional capacity to organise the management of its own development. The impacts of this were so deleterious that still it persists in the structuring of delivery channels for development. Few Turkana institutions are systematically brought into the planning of extension. Little social-mapping of the historically-derived institutions exist, so it is difficult to relate them to state bureaucratic needs of development planning and management under the District Focus.

Thus the planning framework for medium-term (5 years) and long-term (10 years) planning must make different assumptions about the development pathway for Turkana District.

The major elements in conceptualising this pathway are:

1. That Turkana pastoral society is resilient and pastoralism will be the major organizational and production system in the medium- and long-term.

2. That agricultural crop production, forestry and fishing activities must be in support of the pastoral production system.

3. That within agricultural production a greater payoff is likely to come from rainfed agriculture than from irrigated agriculture.

4. That agricultural production can be most efficiently organised by supporting traditional production systems, rather than creating new organizational or land use forms.

5. That where irrigation has been established, the management and production systems should increasingly be handled by farmers organizations.

6. That the economics of irrigated production can be improved by introducing suitable crops requiring minimum input and contributing to the local food supply. Of special interest for expansion are vegetable growing, the expansion of date production, and the introduction of mangoes and other appropriate crops in the 'adakar' or 'ere' and in the irrigated systems.

7. That forestry resources are likely to be stressed in the areas proximate to new urban centres, and thus special planting for local urban fuel supply is mandatory.

8. That expanding forestry resources, through preservation and planting, particularly related to the production of fodder and nitrogen fixation for traditional farming systems, must be the central focus in future plans.

9. That it is important to train significant numbers from the district in pastoral, irrigation, fisheries, forestry and agricultural technical skills so as to have capacity in the community, as opposed to capacity which is national.

10. That to ensure that those trained in technical (including planning) areas make a maximum contribution to the socio-economic system, training of the front line cadres should be given priority. This should not be used as an excuse to deny the community of availing itself of the highest training opportunities where candidates can be identified. It should also not be used to only train informally, as this would deny the individuals formal employment opportunities.

11. That natural disasters such as drought and famine will recur, but their management will need a national framework rather than assuming self-sufficiency in a district where the resource-base does not guarantee it. In this context, there may be need for food-for-work in the two sectors, but how it is to be used is subject to detailed planning.

12. That the forest, livestock and agriculture departments should have a unified extension practice in order to minimize staff and operating costs.

Future Objective

The fundamental future objective agriculture and forestry sectors should then be to support and assist pastoral society to improve production and conserve the physical environment.

Future Strategy

The future strategy for the two sectors will be to maximise implementation through traditional organizational forms. This will ensure community-testing of the rationality of innovations and increase the probability of sustainability. It will also assure the growth of the community processes and organizations as well as their adoption of the activities which the state and its allies assume in the District Focus Strategy for Rural Development.

Since this is a process strategy, priority in sector activities should be given to organising and training. This approach has already begun in the forestry sector. Unfortunately very little of the process approach is found in the agricultural sector.

Future Impacts

If the above approach is followed, it is expected that the impacts will be :

1. The evolution of a viable community whose basic production system is pastoralism, supplemented by rainfed agriculture and irrigated agriculture, in a constantly improving physical environment.

2. An increased capacity of the local community to choose their development and to manage it.

3. A technically trained local cadre able to interact with the communities in technical problem solving.

CHAPTER 10 - ASSESSMENT OF THE PRESENT FACILITIES IN THE DISTRICT AND RECOMMENDATIONS FOR THE FUTURE

10.1 MINISTRY OF AGRICULTURE

10.1.1 District Agricultural Targets

The 1989-1993 District Development Plan has specified production targets in respect of seven crops during the Plan period. With regard to sorghum, which is the most important grain crop in Turkana, the Plan projects production in irrigated fields to expand from 1,200 tonnes in 1989 to 3,430 tonnes by 1993. Similarly rainfed sorghum is anticipated to increase from 16,000 tonnes in 1989 to 21,000 tonnes in 1993. The mission has reviewed these projections and believes that they are achievable. A modified version of these projections is presented in Table 10.1 below.

Table 10.1 - PROJECTED CROP PRODUCTION TARGETS 1989-1993

Crop	Yield (Tonnes/ Ha)	Area (Ha)	Production/ (Tonnes)	Yield (Tonnes/ Ha)	Areas (Ha)	Production (Tonnes)
Irrigated Cotton	3.0	130	390	3.0	400	1200
Irrigated Maize	2.0	450	900	2.5	200	500
Irrigated Sorghum	1.5	800	1200	2.0	1700	3400
Rainfed Sorghum	1.0	16000	16000	1.5	21000	31500

Source: Modified from the District Development Plan, 1989/1993

NB: Yields and hence total production from rainfed sorghum are dependent on rainfall conditions.

For the above targets to be achieved, the MOA will need a complement of staff as well as physical facilities and logistics support.

10.1.2 Assessment of the Available MOA Facilities

a) Agricultural Staff

Presently, the district has a total of 44 technical staff. The deployment of the available staff, however, is considerably skewed in favour of irrigation schemes which are mainly located to the southern part of the district. Areas of dry land cultivation, including North Turkana, have obtained little extension support in the past.

b) Office Facilities

Out of a total of eight divisions, the MOA has only office facilities in three. This means that in the other five divisions, there is no focal point from which extension work can be organized.

c) Transport Facilities

Availability and distribution of transport facilities reflect the existing deployment of extension staff. Most of the transport vehicles are located in the south, particularly within the irrigation schemes. Even then, most of the vehicles are grounded because of mechanical breakdown as shown in Table 10.2.

Table 10.2 - DISTRIBUTION OF VEHICLES AND CURRENT STATE OF OPERATION

Registration	Make	Station	Remarks
GK 633W	L/Rover	Headquarter	working
GK 460U	"	"	grounded
GK N879	"	"	working
GK N540	"	"	grounded
GK B340	Toyota Hilux	"	grounded
KWQ 460	Toyota L/Cruiser	Katilu	working
KWW 948	Toyota L/Cruiser	Katilu	working
GK 242U	L/Rover	Lokori	working
GK A715	Chev.Luv	Kakuma	grounded
KWL 750	Honda	Lokori	grounded
KWL 751	Honda	Katilu	grounded
KWL 752	Honda	Nakwamoru	grounded
GK 377	Leyland lorry	Katilu	grounded
KWL 753	Honda	Katilu	grounded
KWL 754	Honda	Katilu	grounded
KWL 755	Honda	Turkwel	grounded
	Heavy Machinery		
GK 378	Motor grader	Katilu	Serviceable
GK 700 Q	JCB	Katilu	Serviceable
GK 241 U	Ford 6600	Katilu	Serviceable
GK 930 M	Track Marshall	Katilu	Serviceable
GK N352 K	Ford 500	Katilu	Serviceable
40 UN 116 U	Ford county	Katilu	Serviceable

Source: Annual report, Ministry of Agriculture, 1988

10.1.3 Recommendations for the Future

a) Staff Deployment

In order to cope with the anticipated extension work load, the present staff strength of 44 members should be increased by 54 over the next 10 years. **Hence, by 1999 a total of 98 technical staff should be in place. It is expected that the bulk of the additional technical staff will be recruited within the current development plan.**

In addition to the technical cadre, supporting staff comprising drivers, copy typists and artisans are projected to increase from 31 in 1989 to 50 by 1999. **As emphasized elsewhere in this review, nearly all the junior staff (agricultural assistants, copy typists, etc.) should be recruited from within Turkana District (see Section 4.1.4).**

Table 10.3 - STAFF PROJECTIONS BY DIVISION AND TIME FRAME

DIVISION	DESIGNATION	Present	Year 5	Year 10
District HQ	Agricultural Officer	3	4	5
	Technical Officers	3	3	0
Katilu Division	Agricultural Officers	1	1	2
	Technical Officers	2	4	5
	Agricultural Assts.	9	14	15
	Junior Tech.Assistants	2	5	5
Lokori Division	Technical Officer	1	2	2
	Agricultural Assistants	7	9	10
	Junior Agric. Assistants	0	3	3
Turkwel Division	Agricultural Officer	0	1	1
	Technical Officer	1	2	3
	Agricultural Assts.	3	5	7
	Junior Tech. Assts.	3	4	5
Kakuma Division	Agricultural Officer	1	1	1
	Technical Officer	0	2	4
	Agricultural Assistants	3	5	5
Kibish Division	-	-	-	-
Lokitaung Division	Technical Officer	1	1	1
	Agricultural Assist.	0	2	4
	Junior Agric. Assist.	0	2	4
Central Division	Agricultural Assist.	4	6	7
	Junior Agric. Assist.	0	0	3
Total		44	79	98

Source: DAO Lodwar, personal communication

NB: The high staff loading in Katilu is due to the large size of this division and its high rainfed cultivation potential.

b) Office Facilities

Four offices need to be constructed and provided with a modest set of furniture as well as equipment. The priority locations for office construction are Lokori, Kakuma, Lokichoggio, Lokitaung.

Funding requirement for installing office facilities is estimated at Kshs 1.2 million.

c) Transport

To facilitate mobility of the extension staff it is proposed that transport facilities be produced (see Table 10.4).

Table 10.4 - TRANSPORT REQUIREMENTS, PRESENT AND WITHIN 10 YEARS

Work Station	Number Presently Operational		Additional Needed Next 10 Years		Total Operational End of 10 Yrs	
	4 WD	MC *	4 WD	MC*	4-WD	MC*
District Agric. HQs	2	0	3	1	5	1
Katilu	2	1	0	5	2	6
Lokori	1	0	0	3	1	3
Kakuma	0	0	1	3	1	3
Turkwel	0	0	1	3	1	3
Lokichoggio	0	0	1	3	1	3
Lokitaung	0	0	1	3	1	3
Total	5	1	7	21	12	22

* MC = Motorcycles

The basis of the above figures is to ensure that each division has shared vehicles as well as motorcycles. On an experimental basis, the MOA will arrange loans aimed at purchasing bicycles by agricultural assistants. This arrangement is working in other districts of Kenya where such agricultural assistants get a monthly allowance as an incentive.

10.1.4 Budgetary Implications for Physical and Logistical Support

In the 1989-1993 District Development Plan, there was no budgetary provision for the agricultural sector during the 1990/91 - 1992/93. This was a deliberate omission since the precise direction of the agricultural sector was still uncertain at the time of formulating the plan.

The mission recommends that TRDP continue to provide support in the agricultural sector with regard to:

- **installing additional office facilities**
- **purchase of new vehicles and motorcycles**
- **routine procurement of inputs for irrigated and rainfed agriculture**
- **running costs for vehicles, motorcycles and machinery.**

Since the TRDP agricultural budget was conditioned on the outcome of the review mission, it is recommended that GOK and NORAD generate an operation budget.

10.2 FOREST DEPARTMENT AND KEFRI

10.2.1 Forest Department Staff

The Senior staff at the district headquarters consist of the District Forestry Officer (DFO) and his assistant. The DFO is the departmental head in the district. Since most of the activities carried out in the district involve extension work he performs both managerial and extension work. As such there is no District Forest Extension Officer.

There are foresters in seven divisional forest offices. Lokichoggio is a newly created division, hence as yet it has no forester. There is therefore a need to post a forester in this division.

There are no extension staff in the divisions at all, and it is important that every division has an extensionist to help the forester in his duties.

All the nurseries have headmen.

The district has a total of 28 forest guards and 32 patrolmen. In order to enable them to work efficiently, their numbers need to be increased.

The district forester's office has one typist/secretary and two clerks. The divisions need more typists and clerks.

The number of permanent staff in the district needs to be increased since the present force is not adequate. Most of the labourers are casuals. However, the TRDP contract staff also help in the forest activities. If possible, the TRDP staff should be absorbed into the Forest Department under GOK contracts.

The district has already identified a number of personnel who need to be recruited as indicated in the previous assessment. As far as the staff is concerned there is a government policy to have extension staff at location level. It is the feeling of the review mission that each location should have an additional two front line extension staff recruited locally.

In addition, there are 128 regular subordinate staff and 234 casuals.

10.2.2 Recommendations

1) The proposed staffing levels, given the unified approach the team recommends elsewhere, should be as shown in Table 10.5. An additional 59 people should be hired to man the whole district. Other than the 58 locally recruited extension officers recommended in the talbe the other staff requirement falls within the government policy which intends to recruit foresters at locational level.

Table 10.5 - PRESENT DISTRIBUTION OF FOREST DEPARTMENT STAFF AND RECOMMENDED STAFF REQUIREMENTS WITHIN THE NEXT 10 YEARS

	Present	Additional	Total 10 Yrs
District Headquarters	1 DFO	0	1
	1 Asst DFO	0	1
Divisions			
Lokori	1 Forester	0	1
Katilu	1 Forester	0	1
Turkwel	1 Forester	0	1
Lokichoggio	0	1 Forester	1
Kakuma	1 Forester	0	1
Kalokol	1 Forester	0	1
Lokitaung	1 Forester	0	1
Kibish	1 Forester	0	1
Total for 29 Locations			
Extension Staff	0	58	58
Forest Guards	28	0	28
Patrolmen	32	0	32
Total	69	59	128

Source: DFO Lodwar, personal communication

NB: Assistant DFO is currently helping with extension. If he is transferred, there is a need for a District Forestry Extension Officer.

NB: Staffing per location: one forester and one extensionist.

2) The review mission feels that the subordinate staff should not be increased as previously proposed in the 1989/90-1992/93 Plan of Operations. Instead the Forest Department should attempt to improve efficiency of workers and to draw on casual labour of other programmes e.g. TRP. As a result, casuals can be hired on projects as needed.

3) At district level, there are two clerks and one typist. These are adequate at the district level. However there is a need to have a typist in each divisional headquarter. A total of eight more typists should be recruited.

10.2.3 KEFRI Staff

KEFRI only went to the district in 1987. It already has a nucleus staff which need to be increased in the next 10 years as illustrated in Table 10.6 below:

Table 10.6 - PRESENT OUTLINE OF KEFRI STAFF AND PROPOSED SITUATION WITHIN 10 YEARS

Present	Additional Next 10 Years	Total 10 Years
1 Researcher (BSc) 2 Foresters (Dip) 1 Technician (Dip) 1 Technician trainee (Cert)	1 Plant Physiologist (PhD) 1 Plant Nutritionist (PhD) 1 Plant Breeder (PhD) 1 Biometrician (MSc) 1 Plant Products Officer (MSc) 1 Socio-economist (PhD) 1 Agro-forester (PhD)	8 researchers 4 support staff
1 Typist	2 Typists	3 Typists

NB: Additional proposed staffing are subject to collaboration with TREMU to avoid duplications.

10.2.4 Forest Department Physical Facilities

A lot of progress has been made to date as far as office facilities are concerned. There are permanent offices at the District Headquarter and in the Divisions as shown below:

Table 10.7 - DISTRIBUTION OF FOREST DEPARTMENT STAFF HOUSING, PRESENT AND PROPOSED WITHIN THE NEXT 10 YEARS

	Present	Additional Next 10 Yrs	Total 10 Yrs
District HQ	Adequate	0	1 house
Lokori	Adequate	0	1 house
Katilu	Adequate	0	1 house
Turkwel	Being built	0	1 house
Lokichoggio	-	1 house	1 house
Kakuma	Adequate	0	1 house
Kalokol	Adequate	0	1 house
Lokitaung	Adequate	0	1 house
Kibish	-	1 house	1 house
Total	7	2 houses	9 houses

NB: The additional two staff houses are for Lodwar and Lokichoggio.

10.2.5. KEFRI Physical Facilities

KEFRI office at Lodwar needed to be extended to accommodate increased researchers.

Table 10.8 - DISTRIBUTION OF KEFRI FACILITIES, PRESENT AND PROPOSED WITHIN THE NEXT 10 YEARS

	Present	Additional 10 Yrs	Total 10 Yrs
Offices	2	5	7
Registries	1	0	1
Laboratories	1	3	4
Staff houses	1	7	8

NB: TREMU and KEFRI may be able to share certain facilities.

10.2.6 Tree Nurseries

The Forest Department tree nurseries should be decentralized as much as possible for more efficiency and cost reduction.

KEFRI needs one research nursery at Lodwar. The following items are also needed:

- metal seedling containers
- nursery shed with different light intensities
- a nursery store
- a vegetative propagation unit
- a soil mixing bay.

10.2.7 Forest Department Transport and Equipment

The transport and equipment position of the Forest Department is as follows:

Table 10.9 - CURRENT AND PROPOSED 10 YEAR DISTRIBUTION OF VEHICLES AND EQUIPMENT BY TYPE

Present	Additional Within 10 Yrs	Total 10 Yrs
4 land cruisers (2 to be boarded)	7	9 (11 less 2)
0 bicycles	58	58 (2 bicycles/location)
2 typewriters	7	9

Four vehicles are awaiting clearance in Nairobi. Each division needs a vehicle to avoid the current sharing which exacerbates the rate of breakdown.

The Department also wants audio-visual equipment for forestry extension work.

10.2.8 KEFRI Transport

KEFRI has got one vehicle now. The following additional vehicles and equipment will be needed by the researchers:

- 1 saloon cars
- 5 4-WD pickups
- 1 tractor
- 1 lorry
- 4 bicycles
- 4 IBM compatible 40 megabyte computers
- laboratory equipment.

CHAPTER 11 - IDEAS AS TO WAYS AND MEANS THAT KEFRI AND TREMU MAY COOPERATE IN NATURAL RESOURCE RESEARCH IN TURKANA DISTRICT

There are at present two research institutions in Turkana that are undertaking research on natural resource management in the district, i.e. TREMU and KEFRI.

KEFRI moved in after a review of the TRDP Forestry Development Project 1984/85-1986/87 in October 1986 had recommended that KEFRI should take over responsibility for forestry research activities in the district.

TREMU was set up after UNESCO had been approached by NORAD in 1986 requesting them to assist in scientific research on natural resource management in Turkana, in the provision of information and in advising the district planners.

The forestry review team of 1986 suggested that research programmes could be undertaken jointly, with KEFRI specializing in species selection, development of planting and harvesting systems and TREMU taking responsibility for long-term monitoring of vegetation and management of range resources.

TREMU has a multi-disciplinary approach allowing it to deal with the interface of ecology and socio-economics. Thus, it tries to integrate many aspects that KEFRI and others look at in a rather sectoral manner.

The two institutions, KEFRI and TREMU, have presented their respective project proposals (KEFRI Project Proposal, phase II 1989/90 to 1992/93 and UNESCO, Draft Project Document of July 1989 starting January 1990). The budgets of the two projects are estimated to be Kshs 7.780 million and US$ 2.825 million respectively. The former project was presented by the district authorities for NORAD-funding under the TRDP, whilst the latter was presented to NORAD through UNESCO.

It appears from the above cost-estimates that the two projects will require a large amount of money in relation to the funds NORAD has indicated Norway may be prepared to offer for the coming 4-year period towards the development of Turkana. If the projects are approved of as they are, or partly approved, they will definitely affect the funding of other development activities. Thus, the competition for funds calls for an economic use of funds as well as an optimal use of research manpower resources in Turkana.

A multi-disciplinary research approach requires input from various fields of specialization (human ecology, vegetation, livestock, meteorology, hydrology, soils, etc.) Some of the disciplines are already fairly well covered in the district. Therefore, there should not be a need for overlapping by establishing similar services within TREMU. Instead, TREMU should aim at making use of the capacity and services available in the district, and from KEFRI in particular. Such a collaboration would also help TREMU to disseminate its research findings.

The team feels that the division of labour between TREMU and KEFRI as suggested by the 1986 forestry review team, is a sound one. So KEFRI should concentrate on species selection, development of planting and harvesting and TREMU should be able to draw on KEFRI for services and information within these fields.

Besides division of labour with co-ordination in the use of manpower in their respective fields of operation and subsequent co-operation through the exchange of data and information, there should be an arrangement for making use of each other's facilities (offices, laboratories, equipment, and transport). **TREMU has recently set up offices and laboratory facilities in Lodwar which could**

probably be utilized more extensively than at present. Instead of the TRDP considering a request from KEFRI for an extension of their rather modest facilities in Lodwar, efforts should be made to accommodate some of KEFRI's needs within the TREMU facilities.

There is an obvious need for an organizational body that can ensure proper co-ordination between the two institutions. If the newly appointed District Environment Officer and the District Sub-Committee for Research do not provide the desired coordination, efforts should be made to establish a local committee with representatives from the two institutions which would meet regularly. Furthermore, KEFRI should be represented on the proposed steering committee of TREMU, whilst TREMU should take part in district meetings whenever KEFRI issues are on the agenda.

During the TREMU review (Ref. Report of the TREMU Review Mission, January 1989) a lack of communication between TREMU and the district officials was revealed. In order to facilitate and promote closer day-to-day contact between TREMU and the district in general, and the District Planning Unit in particular, TREMU funding could partly come from the TRDP. The TRDP could have a vote for natural resource research to be applied for by TREMU as well as by KEFRI, and/or jointly by both.

CHAPTER 12 - COMMENTS AND IDEAS AS TO POSSIBLE WORK THAT THE MINISTRY OF AGRICULTURE, FOREST DEPARTMENT AND KEFRI MAY NEED TO UNDERTAKE TO OFFSET POSSIBLE NEGATIVE IMPACTS OF THE TURKWEL GORGE DAM ON THE RIVERINE FORESTS AND AGRICULTURE ALONG THE RIVER

12.1 BACKGROUND

The Turkana are traditionally nomadic pastoralists. However, they also practice rainfed sorghum farming along the Turkwel river flood plains. Rainfed gardens were situated in silt deposits resulting from changes in the river course, where only a few trees grow. With the creation of gardens in the riverine forests, tree* such as Salvadora persica, Hyphaene coriacea and Acacia tortilis have been cleared from the area.

12.2 ASSESSMENT

The only existing information on the dam is contained in a 1979 report by Norconsult A.S. This data is not adequate for prediction purposes because the dam under construction does not follow the design protocols of that report.

In 1979, it was estimated that in the immediate Turkwel flood plain about 4000 ha of irrigable land was potentially available on the Turkwel floodplain.

It was then considered that the triangle of land contained between the Turkana District boundary, the Malmalte and the Turkwel rivers and a tract of land on the left bank of the Turkwel beginning about 6 km downstream of the Twin Islands was suitable for irrigation. These covered a total area of some 6000 ha.

Advantages considered for developing these areas vis-a-vis floodplain irrigation schemes were:

i) clearing costs would be low as the areas were only covered by thin Acacia bush, rather than thick riverine forest;

ii) the area was divided into large blocks. These could be more efficiently serviced with infrastructural developments such as roads, more effectively managed and were closer to sources of electric power than schemes scattered down the length of the floodplain would be;

iii) the problem of water loss through seepage and evapo-transpiration in the floodplain was expected to be more or less eliminated as the areas were within a few kilometers of the proposed outlet from the power station.

However, there were some obvious deficiencies in basic hydrological data then and now. As a result, a great need for an extended data collection programme was recommended before final decisions could be made about building the dam. It was envisaged that the basis for analysis and proposals for specific measures to be taken and reservoir operation would plan to minimize the effects of siltation. For one reason or another, the proposed studies were never carried out.

12.3 RECOMMENDATIONS

The problem of seepage and evapo-transpiration losses downstream of the Turkwel Gorge has been discussed at some length with particular emphasis on the lack of data. But since it was never considered feasible nor necessary to initiate complicated and costly studies, even the empirical approach initially recommended was not done. Building of the dam is now complete and inundation will soon begin. As a result, the review mission recommends that systematic empirical long-term assessments to monitor downstream impacts of the dam be started.

After the dam is full, the quantity of surplus water over and above the requirements of existing irrigation should be assessed before commissioning new irrigation schemes.

TREMU and KEFRI should establish long-term sample plots to determine likely changes in plant population dynamics (species diversity and composition) with a view to prescribing corrective measures.

APPENDIX I

COMPOSITION OF THE REVIEW TEAM

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Mr. Per Prestgard	-	Natural Resource Management Division, NORAD, Oslo.
Mr. James Macharia	-	Ministry of Environment and Natural Resources (MENR).
Mr. Patrick Milimo	-	Kenya Forestry Research Institute (KEFRI).
Mr. Mosoti Andama	-	Ministry of Agriculture (MOA).
Mr. Mwangi Wandurwa	-	Ministry of Agriculture (MOA).
Mr. David Kamweti	-	Forestry Consultant, Kamfor Co. Ltd.
Mr. John Kimani	-	Agricultural Consultant, Rural Development Services Ltd.
Prof. G. C. Mutiso	-	Extension, Training and Institutional Support Consultant, Muticon Ltd.
Dr. Peggy Fry	-	Socio-Anthropology Consultant and Secretary, Norconsult A.S.
Ms. Aru Inamdar	-	Secretary, Norconsult A.S.

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Mr. Patrick Milimo	-	Kenya Forestry Research Institute (KEFRI).
Mr. Mosoti Andama	-	Ministry of Agriculture (MOA).
Mr. Mwangi Wandurwa	-	Ministry of Agriculture (MOA).
Mr. David Kamweti	-	Forestry Consultant, Kamfor Co. Ltd.
Mr. John Kimani	-	Agricultural Consultant, Rural Development Services Ltd.
Prof. G. C. Mutiso	-	Extension, Training and Institutional Support Consultant, Muticon Ltd.
Dr. Peggy Fry	-	Socio-Anthropology Consultant and Secretary, Norconsult A.S.
Ms. Aru Inamdar	-	Secretary, Norconsult A.S.

APPENDIX II

TERMS OF REFERENCE FOR THE AGRICULTURE AND FORESTRY SECTOR REVIEW, 1989

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TERMS OF REFERENCE FOR FORESTRY SECTOR REVIEW 1989

The Team shall :

(1) Review the implementation and progress of The Turkana Forestry Development Project including the following :

(a) Courses conducted, (type of courses, course content and attendance).
(b) Extension material produced, type and target groups.
(c) Tree planting activities, species, people involved.
(d) Agro-forestry activities (in conjunction with the Agriculture review team and input from the livestock sector).

(2) Review the implementation and progress of NORAD funded Kenya Forestry Research Institute project in the District, relating such activities to work being carried out within other programmes/projects. Particular attention should be paid to:

(a) Forestry Research in the District.
(b) Forestry Research in Turkana with respect to National Forestry Research Objectives.

(3) Assess the roles of the Forestry Department and KEFRI in the development of the District.

(4) Assess the position of the different Forestry Sector Activities (Forestry Department and KEFRI) under the following headings :

(a) Research
(b) Conservation and Management
(c) Tree planting and tree nurseries
(d) Extension, Education and Training

and relate these activities to work being done within other programmes/projects.

(5) Suggest proposals for any necessary changes in objectives, strategy or implementation for the forestry sector activities that can be incorporated into the 1989/90 to 1992/93 Forestry Sector Plan of Action under TRDP as well as providing input into a longer ten year planning cycle.

(6) Review the role of other Governmental and Non Governmental organizations involved in forestry activities.

(7) Review the recurrent Forestry Department and KEFRI budgets and assess how it can cope with the increased level of qualified forestry staff at the district and divisional level. This should be related to the changing work demand being placed on the department for services.

(8) Assess the current Forestry Department and KEFRI facilities in the district and recommend any further facilities that may be needed in the future.

(9) From available literature, data and material provide some comments and ideas into possible work that the Forestry Department and KEFRI may need to undertake to offset possible negative impacts of the Turkwel Gorge dam on the Turkwel Riverine Forest. This could be related to different scenarios concerning the flow of the river.

(10) Suggest concrete ideas as to ways and means that KEFRI and TREMU can co-operate in real terms in Natural Resource Research in the District.

(11) Assess project impact and strategy in relation to future viability of the Forestry Sector Programme within TRDP.

13.9.89/EF

TERMS OF REFERENCE FOR AGRICULTURE SECTOR REVIEW

The team shall :

(1) Assess NORAD funded irrigation schemes and relate these to irrigation work being done within other programmes/projects.

(2) Look at problems and make recommendations on the maintenance of schemes, in both short and long term perspective.

(3) Examine the effectiveness of extension services to farmers on the schemes.

(4) Assess to what extent women have been successfully targeted.

(5) Review the effect of Katilu Cooperative and the strategy behind and effect of Water Users Association.

(6) Assess to what extent work on farming systems has progressed, and make recommendations on future farming systems planning.

(7) Review Agro-Forestry practices in Turkana.

(8) Provide some comments and ideas into possible work that the Ministry of Agriculture may need to identify which may offset any possible negative impacts of the Turkwell Gorge dam on Turkana agriculture. This could be related to different scenarios concerning the flow of the river.

(9) Evaluate what groundwork has been done on dryland agriculture by the Agriculture Department and others, and their capacity to develop and sustain initiatives in this sector.

(10) Assess the relative importance of Rainfed Agriculture and Water Harvesting in Turkana.

(11) Assess the work carried out at the Date Palm Project to date, and evaluate the proposal prepared by the department with a view to future funding and the possibilities of expanding Date Palm production.

(12) Assess Project impact and strategy in relation to future viability of the Agriculture Sector Programme within TRDP.

(13) Make recommendations on organization of activities in dryland agriculture for the future.

13.9.89/BF

APPENDIX III

AGRICULTURE AND FORESTRY REVIEW MISSION:

ITINERARY PROGRAMME

APPENDIX III

AGRICULTURE AND FORESTRY REVIEW MISSION: ITINERARY PROGRAMME

DAY:	ACTIVITIES:
Sunday 22st October	Arrival in Lodwar
Monday 23rd October	Introduction and Briefing - TRDP office Lodwar Tree Nursery Nakuta Site Tree Planting Napuu Site Tree Planting Kawalathe Site Tree Species Trial TB Manyatta Tree Planting Incentive Scheme
Tuesday 24th October	Turkwel Irrigation Scheme Date Palm Project Turkwel Tree Nursery Kalemenyang Irrigation Scheme TRP Water Harvesting Structures
Wednesday 25th October	Kakuma Tree Nursery Nomadic School Tree Planting Micro-catchments Kalobeyei Gum Arabic and Nebek Species Trials Lokichoggio Micro-catchments TRP Water-Harvesting Structures
Thursday 26th October	- Half of the team - Lokitaung Tree Nursery OXFAM's Water-Harvesting Sites, Kacoda and Kaling - Half of the team - Kalokol Secondary School Tree Planting Micro-catchments Kalatum Tree Species Trials Doum Palm Regeneration Trials
Friday 27th October	Lokitaung Secondary School Tree Planting OXFAM's Water-Harvesting Lake Shore Sites
Saturday 28th October and Sunday 29th October	Discussions and Write-up, Lodwar
Monday 30th October	Katilu Tree Nursery Katilu Irrigation Scheme Met Water Users Association Members Met with Katilu Cooperative Society Lokapel Rainfed Gardens
Tuesday 31st October	Anolem Irrigation Scheme Loyapat Irrigation Scheme Julluk Irrigation Scheme Nakwamoru Irrigation Scheme

Wednesday 1st November	Lotubae/Lokwi Irrigation Scheme Morulem Irrigation Scheme Lokori Tree Nursery Kangetet School Tree Planting
Thursday 2nd November through Sunday 5th November	Final Discussions and Write-Up, Lodwar
Monday 6th November through Wednesday 8th November	Final Discussions in Nairobi, NORAD Offices

APPENDIX IV

LIST OF PERSONS CONTACTED

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LIST OF PERSONS CONTACTED

Mr. S. M. Toyya	-	District Commissione, Lodwar
Mr. S. Ngugi	-	District Agricultural Officer, Lodwar
Mr. T. M. Anyonge	-	District Forestry Officer, Lodwar
Mr. C. O. Nyandiga	-	Assist. Research Officer, KEFRI, Lodwar
Mr. M. A. Ikimat	-	Date Project Officer, Lodwar
Mr. K. Wamichwe	-	Assist. Forestry Officer, Lodwar
Mr. E. Barrow	-	Acting Project Adviser, TRDP, Lodwar
Mr. R. van den Boogaard	-	TDCPU Coordinator, Lodwar
Ms. I. Sangnes	-	Social Services Adviser, TRDP, Lodwar
Ms. H. Lungule	-	Soc. Dev. Assist., MOCSS, Lodwar
Mr. G. Oba	-	Range Ecologist & Team Leader, TREMU, Lodwar
Mr. P. Wagura	-	District Animal Production Officer, Lodwar
Mr. G. Murwara	-	Dist. Water Harvest. & Soil Conser. Off., Lodwar
Mr. D. Augo	-	Forester, Kalakol
Mr. W. S. Wabomba	-	Assist. Agric. Officer, Turkwel
Ms. R. Musyoka	-	Assist. Agric. Officer, Turkwel
Mr. J. K. Kaboro	-	Assist. Agric. Officer, Turkwel
Mr. E. Otieno	-	Technical Coordinator, TRP, Kalemenyang
Mr. J. Gakere	-	Forester, Kakuma
Mr. Musa	-	Chief, Lorugumu
Mr. J. Kuchala	-	Chief, Kakuma
Mr. C. Mussaba	-	Head Master, Nomadic School, Kakuma
Mr. K. Mutai	-	Asst. Teacher, Nomadic School, Kakuma
Mr. R. Mutoro	-	TRP Storeman, Lokichoggio
Mr. M. Pringan	-	TRP Area Coordinator, Kakuma
Mr. O. Aseno	-	Forester, Lokitaung
Mr. P. Chochu	-	Project Secretary, TWIP, Kaling
Mr. A. Cullis	-	Dryland Food Securiy Prog., ITDG, Lodwar
Ms. C. Wilson	-	Anthropological Consultant, ITDG, Lodwar
Mr. R. Omuhaya	-	District Officer, Katilu
Mr. L. Kivihya	-	Forester, Katilu
Mr. S. Abots	-	Chief, Katilu
Mr. F. Simiye	-	Cooperative Agric. Sec./Manager, Katilu
Mr. P. Amilyo	-	Cooperative Vice-chairman, Katilu
Mr. R. Nasur	-	WUA Management Facilitator, Katilu
Mr. F. Kokoi	-	Councillor, Loyapat
Mr. S. Emathe	-	Asst. Chief, Loyapat
Ms. R. Rukoo	-	WUA Committee Member, Katilu
Mr. P. Akiru	-	WUA Vice-chairman, Katilu
Mr. S. Ekiru	-	WUA Committee Member, Katilu
Mr. E. Ereng	-	WUA Committee Member, Katilu
Mr. S. Kamarinyang	-	WUA Chairman, Loyapat
Mr. Singoe	-	Irrigation Officer, Julluk
Mr. J. Kokiro	-	KFC Secretary, Nakwamoru
Ms. J. Abenyo	-	Assist. Agric. Officer, Lokori
Mr. D. Tanui	-	Assist. Agric. Officer, Lokwi
Mr. J. Atelo	-	WUA Chairman, Morulem
Mr. H. Githinji	-	Forester, Lokori
Mr. D. Oyoo	-	District Officer, Kalakol
Mr. S. Kioko	-	Chairman, Cotton Lint & Seed Marketing Board, Nb

APPENDIX V

LIST OF REFERENCES

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