

PART THREE: THE CATCHMENT APPROACH

THE CATCHMENT APPROACH FOR COLLECTIVE SELF RELIANCE

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INTRODUCTION

An idealised logical framework for the development of Kitui District can read as follows:

Long term objectives (20-25 years)

1. Food security has become an established fact. Furthermore, the District is a net exporter of food and livestock.
2. Agro- and livestock industry, as well as a related services sector, offer employment to the landless and those unable to derive an income from farming alone.
3. Kitui District has become a full participant in the affairs of the national economy, which includes decision making in aspects of rural policy and protecting the interests of the district and its people.
4. Dependence on income earned outside the District has become an item of local history.
5. Land adjudication has essentially been completed.
6. The population knows the limits of the physical resources base and is well trained on how to use the environment to its best advantage and how to cope with the contingencies of recurrent droughts.

Short term objectives (10-15 years)

1. One third of necessary land conservation has been completed and another third is in the process of being carried out. The effects of land conservation on increased production are clearly visible and measurable.
2. Definition of land use policies and land use limitations, based on sound ecological principles, have been completed, accepted and adopted by the population.
3. Farmer groups routinely carry out their own planning and implementation of plans with assistance from the government.

4. A system of organised production and marketing managed by farmers principally.
5. Land adjudication and collective ownership of key waterpoints is well in progress.
6. Local workshops produce and repair tools and farming implements at tax free prices. The system of purchasing these in Nairobi and distributing them through the government has been abandoned.

Near term objectives (5 years)

Farm production, the potential of the resources base in general, and farm income have increased significantly through:

1. Organised production and marketing of cash crops and livestock, guaranteeing fair prices to producers, and utilising profits to improve community interests and beneficial public works, including infrastructure.
2. Systematic rehabilitation and improvement of the resources base, with emphasis on water availability, soil conservation, and biomass production.
3. Rehabilitation and improvement of the resource base closely follows the criteria of detailed land use planning and farm planning, jointly worked out between the community and government staff.
4. Government staff and key community members are adequately trained to identify resource improvement strategies and to plan.
5. Implementation strategies and schedules for land adjudication are carried out.
6. Community groups and committees actively pursue organisation and implementation of development activities agreed upon by all.

Outputs

1. Training of government staff and the community.
2. Training of school going children (School shambas).
3. Production of manuals (technical, participation, etc.).
4. Land information system (land evaluation, etc.)
5. Market information and marketing channels.
6. Crop-, pasture-, forestry-, agroforestry trial results or indicative results.
7. Viable procedures for coordination and organisation of government departments in development activities.
8. Land use plans and farm plans produced by communities in conjunction

with government.

Inputs

1. Political will and institutional arrangement.
2. Technical know how.
3. Preliminary consultations with the community.
4. Participative baseline survey.
5. Plan of operations and workplan(s).
6. Technical assistance.
7. Operational funds.
8. Equipment and materials.
9. Buildings and transport.

The above presented logical framework contains three basic elements. These are people, economy and resources. More succinctly:

$$\text{People} + \text{Resources} = \text{Economy}$$

Increasing people's knowledge, skills, by making information on effectiveness of communication, rights, independence, awareness, and consciousness about themselves, their needs, each other, their environment, their heritage, etc. available to them, options for expand the economy become available to local communities. Similarly, increasing biomass production (crops, pasture, trees) and water availability creates new and alternative options for communities.

It is important to note that the sum of these elements and their attributes, as well as their potential synergy, is contained in a system which is in equilibrium. Injudicious change of one single attribute may lead to dysfunction or a downturn in performance of the system, and eventually to poverty. Poverty both causes and results from environmental problems, which are defined as a system out of equilibrium. Conversely, attempts to improve conditions cannot be limited to any one attribute for this creates instability. Adjustments have to be made to each and every one.

The present situation of Kitui is the result of past (colonial) policies and explosive population growth. Notions that improvement can be limited to soil conservation, construction of waterpoints, and community organisation alone are fallacious. A host of simultaneous activities and policies must be carried out to achieve envisaged objectives.

Resources, the corresponding ecology, and by extension the environment, within the confines of climate are all largely shaped - directly and indirectly - by the hydrologic cycle and the way in which it is managed, and vice versa. Manipulation of the hydrologic cycle serves different purposes in different environments. In the ASAL conditions of Kitui, there is only one purpose. This

is to slow down the processes of runoff, evaporation, and evapotranspiration in such a manner that scarce rainfall, ranging from 350mm to 1400mm a year, can be used for production, preferably using the available water more than once. As the margins between production or lack of it under ASAL conditions are extremely small, careful intervention in the physical part of the system and its hydrologic cycle is a basic requirement. In other words the objective of all development is to intervene in the physical system, particularly the hydrologic cycle to increase production. Of course such intervention is by people and thus it assures participation.

Hydrological cycles take place within geographical boundaries. These are the catchments (English), watersheds (American), or simply drainage basins. The order (or Strahler order) in the hierarchy of the drainage network determines the size of the catchment in the particular basin. A catchment bordering an Inselberg in Kitui District or the crest of a hill may be of the 1st (8 ha), 2nd (20 ha), or 3rd order (80 ha). A catchment the size of the Tana River drainage system, in which all the (sub)catchments of Kitui drain, is somewhere of the 14th order, covering more than 10 million ha.

The system, including the hydrological cycle, contained within a catchment, determines the amount of biomass produced. Biomass is needed for people and their animals, as well as to maintain soil fertility. In Kitui approximately 40% of biomass production must be returned to the land to sustain production. Striking the right balance (or producing the required amounts) between the needs of human populations, animals, and the land for biomass is called land conservation. Soil conservation is a component of land conservation. Land conservation and the catchment approach are synonymous. In the Kitui scenario land conservation also means raising the potential of the land beyond its original state before settlement by the Boran and later the Akamba, to cope with the needs of a manifold increase in population.

Catchments that are of importance to the development of Kitui District are seldom larger than 500-800 ha. Perhaps this seems little, but they are numerous. They are mostly situated on sloping land near hills or inselbergs, coinciding with soils of moderate fertility (as opposed to soils of low fertility on the plains), higher rainfall (orographic effect), and the presence of portable water from springs, or groundwater at shallow depths, or rivers. Naturally these areas are also the most densely settled. Their development indirectly benefits the lower lying areas because of better water management and their function as fallback areas during dry spells. The logical framework is primarily meant for the communities living here.

GENERAL CONDITIONS FOR A VIABLE APPROACH

1. The link with income generation

In Kitui District, the link between income generation and resource improvement was clearly established during the ALDEV days. Options to generate income principally from crops are, however, limited. Extensive research by the UNGA Group (pers. comm.) since 1985 in agro-ecological zones IV and V has shown that of all the oil crop trials that were conducted only Sesame (sim sim) gives an adequate return to the farmer and an acceptable oil content for industrial processing, further taking into account the prevailing ASAL conditions of small-holdings, low technology, and low input. Supplementary income can possibly be derived from Castor Oil, Cashew Nut, and Aloe (Aloe vera).

Maize must be regarded as a subsistence crop only. In AEZ IV a regular harvest requires at least terracing. In AEZ V terracing must be combined with water harvesting (ratio land to crop is 3:1), and in both zones regular ploughing and organic farming must be introduced to minimise the risk of crop failure.

Millet (in AEZ V in particular) during the previous seasons has proven a significant income earner. Degazettement of this crop means that its price will no longer be in step with inflation signifying that it will gradually drop, unless a major new utilisation process is build up nationally. Pigeon Pea and Green Gram, on the other hand, have profited from this policy, as there is a ready export market to the Indian subcontinent and Middle East.

The basic message for ASAL regarding farm income outside the livestock sector is to diversify as much as conditions permit. This includes growing trees for timber, fruits, fodder, construction, and energy, and to combine these uses with land conservation practises, including water conservation, soil fertility enhancement, and erosion prevention measures.

Traditionally mixed farming denotes security against drought and cash income. Mixed farming, although not indispensable for crop production, is an important component so as to increase the fertility of the land. Farmers should however, change from using manure directly to preparing compost, which is more effective and covers a larger area.

Considering that farmers need to receive a fair price for their produce, organised production and organised marketing by groups at the catchment level is a necessity. It must be the intention from the outset that eventually these groups form organisations. As shown in Figure 1 the required steps and elements leading to this automatically generate community participation. With further reference to Figure 1 the author of this paper personally witnessed the rise of a farmer organisation from Phase 1 to Phase 4 over a period spanning 7 years. The said organisation represents 30,000 Afro-American, largely illiterate farming families, who are also an ethnic minority,

in Colombia - South America. Presently they are a political force to be reckoned with at the provincial level.

INSERT FIGURE 1: KEY ELEMENTS TOWARDS RURAL ORGANISATION

2. The livestock factor

Livestock, historically and presently, has been the principal source of income from the land. Given the potential of Kitui District, raising livestock will continue to play a dominant role provided large scale land conservation is carried out. However, if present trends of ecological degradation continue, both livestock and people face a bleak future. People during the past centuries have shown an impressive tenacity to hold on to their animals, especially their breeding stock. Livestock provides a buffer against drought, cash at a moment's notice, and is highly profitable in years of adequate rainfall and a low incidence of endemic diseases. The present crossroads at which Kitui finds itself is characterised by a "nothing or all" situation. Land conservation must lead the way to a viable future.

Livestock development strategies designed by government and donors traditionally concentrated on creating grazing blocs to replace the pastoral system. The technical options came from the range management traditions of North America with their emphasis on rotation. The scarcity of land and massive social changes during the past 40 years, have led to a complex farming system in which this traditional approach to livestock production does not fit. What appears good for the Maasai and other primarily livestock producers does not necessarily apply to Kitui Akamba for crops are significant in their farming system.

The lack of freely available land and the necessity of land ownership as a condition for viable resource conservation and improvement dictate that raising and keeping livestock at the farm level must take priority rather than to continue with past practises. If in this sense the needs of the population can be met, and it this is further implemented in conjunction with animal health care and improvements on the present marketing system, any kind of development programme will have a built in foundation for success and a handle to exercise control over matters concerning resource management.

Obviously the limiting factors for such an approach are water and fodder. In practice this means conserving soil and water run off. Careful farm planning is therefore a pre-requisite. Measures to be taken include terracing of land for crops, fodder grass and fodder trees to enhance the production of each, as well as developing waterpoints at every opportunity. (Pruned) fodder trees also serve to establish a micro-climate. Mutiso and Mutiso (1991) describe a case study of this nature in Machakos District in AEZ V on a farm raising Friesians, a phenomenon that defies conventional logic. There are nevertheless other farms in the same district with similar results which demonstrate a healthy return on capitalising the AEZ V land.

3. Land adjudication

The colonial land policies and the socio-demographic upheavals during this century have generated a breakdown of the traditional land tenure system. This, in turn, has caused the present insecurity regarding land ownership which lies at the root of ecological degradation. Rather than to point the finger at overgrazing, one of the major solutions to continued ecological degradation concerns land adjudication.

Land adjudication in ASAL over the past 30 years has been painfully slow, lagging consistently and significantly behind the Kenya Highlands where, for socio-political reasons, the issue has been considered of higher priority. However, land adjudication must be recognised as a key element in the ecologic and economic survival of ASAL.

Land adjudication was incorporated in the package of KIDP activities in May 1990, but has recently been abandoned, as it was regarded more as a "sweetener" for farmers implementing conservation measures than an essential component of land development.

ASAL development is concerned with the management of a system consisting of catchments and including land conservation, land adjudication, people and their characteristics, income generation, and others. Instead of approaching land adjudication as a sectoral activity it must be incorporated as part and parcel of the catchment approach. Moreover, adjudication has a key role in achieving collective self reliance. In this sense organised groups, with a little help can undertake the first steps towards adjudication of their land themselves, which also is indirectly conducive to joint land use planning. Furthermore, under normal circumstances, government grants priority treatment to people helping themselves.

4. A district planning base

The absence of a planning base has allowed the rich in the district to benefit disproportionately as from early this century until today. It has allowed political interest to prevail at the expense of considerations of equal weight. More important, it has severely inhibited a structural approach to development. Successive donors repeatedly spend small fortunes on collecting pre-requisite information for their intended activities.

The district at this moment lacks a basis for rational development decision making. The main component of the desired planning base is a land information system to provide answers as to the potential of the district and the available development options concerning the different land uses and sectors. It also needs to provide a framework for considering alternative policies, and in each case to ensure rational ecologic management. Obviously the facility of priority ranking in the decision making process for

given options is an indispensable tool.

Within the land information system, the first and paramount step deals with land evaluation. Land evaluation basically determines the potential, the limitations, and the management norms of land and the available land use options (i.e. the different suitabilities). Land evaluation is preceded by human and natural resources surveys, and followed by land use planning. Land evaluation is also indirectly concerned with matters such as land adjudication and land reform, valuation of land (i.e. land taxation), controlled settlement, as well as serving as a tool for land administration by central and local government.

**INSERT FIGURE 2: FLOWCHART OF ACTIVITIES
(INTEGRATION OF SOCIO-ECONOMIC AND PHYSICAL ASPECTS)**

Land evaluation of Kitui District will take 17 locally trained persons approximately 5 years to complete at a cost of some 33 million Ksh. A summary outline of the undertaking is provided in the KIDP Workplan 1990/91. Figure 2 shows the parameters forming part of the study. Although the cost may seem high and the required time drawn out, once completed the district will possess the means to coordinate development activities in a structural, effective, and economic manner. As exemplified by Figure 2, it is further worth noting that present development activities, including those financed by donors, are based on knowledge that seldom goes beyond the pre-survey stage. From the same figure, it can be shown that at the base process level, preceding the early planning stage, a significant amount of information (e.g. USAID) is already available. This, however, needs to be put in a framework, and supplemented by other surveys to be useful.

5. Institutional arrangement

Government implementation of development is by definition slow, expensive, and inflexible. Government at the district level in Kitui is further hampered by a lack of operational funds, modern day facilities, and staff untrained to meet the present development needs. The private sector cannot possibly fill these gaps without outside assistance. NGO's faced with these constraints inevitably and inexorably turn into parallel fiefs in (largely unsuccessful) attempts to achieve their ends. Donors (USAID, DANIDA) work by some arcane rules preventing any significant output that does not justify the cost. Self imposed restrictions consequently make them pack up and leave at the earliest opportunity, whilst being blamed for their ineptitude in the bargain.

Without radical changes to the present structure and with a view on breaking the aforementioned impasse, consideration should be given to the following recommendations:

- District headquarters of the relevant ministries and ministerial departments should be trimmed down. Significantly reduced numbers of staff should concentrate on administrative chores, supplying technical information and materials to interested parties, conducting workshops and training courses, and participating actively in the DPU.
- Wherever possible (e.g. veterinary services) aspects of government should pass to the private sector, though it must be recognised that outside help for quite a number of years is a requirement, taking the form of subsidies to farmers who cannot afford to pay the full price.
- Bearing in mind the overriding importance of developing waterpoints in the district and the inability of MoA and MoWD to keep adequate numbers of artisans on their payrolls to meet demand, it is essential to set up an

organisation (NGO) to keep a core of these in the district. Otherwise they will move elsewhere, with KIDP and others suffering the consequences.

- At the divisional level ministerial staff must be moulded into multi-disciplinary teams who are answerable only to divisional coordinators appointed or delegated by MRDASW or the DDO's Office. Also, staff must be significantly graded.

- The present national system of regularly rotating staff must be reviewed. In addition, rotation must be limited to a system from ASAL to ASAL, with a view of building up necessary expertise. The formal education system should consider setting up a school or institute (including short post-graduate courses) with a sole curriculum on ASAL development.

- The DC's Office (Treasury) must be modernised, whilst the DDO's Office must be modernised, upgraded, and expanded to take the leading role for which it has been designed. This also include the DIDC. The DPU must fulfil its designated role in all aspects of planning. Financial planning, work-plans, building of a planning base, and the like of all departments and programmes (including KIDP) must be passed by the DPU prior to going anywhere else.

- The DPU must have its own full time planning team. The earlier proposed land evaluation must be carried out under the auspices of the DPU or directly by the DPU.

- The DDC cannot approve projects or activities that have not been scrutinised and commented upon by the DPU.

- Under the previous setup the role of KIDP does not need to be reviewed, with the exception of transmitting plans and recommendations through the DPU before reaching the DDC.

- The role of the DC remains unchanged, but becomes more closely involved. Though the designated role of the DDO also remains unchanged, in practice this will be finally enhanced, in line with District Focus.

6. Training and qualifications of staff

Ogongo (1991) comments: " One of the major constraints among some cadres of district personnel is the apparent lack of basic knowledge and skills, and low level of commitment in the discharge of their functions. In the circumstances even the best of policies and programmes cannot be effectively implemented to realise that intended policy or programme objectives....

...Adoption of new attitudes could be achieved through a new set of

incentives for all cadres of personnel. The present level of performance, care and handling of public tasks and resources is not a manifestation of full utilisation of the existing potential".

These comments reflect a general lack of knowledge by government personnel regarding the potential of ASAL, a lack of challenge, and a widespread perception that appointments are second rate as compared to those in high potential districts. Moreover, there is a prevailing thought, shared by various donors, that development of ASAL is a waste of resources, and it holds no future. Generally there is as yet no understanding of the crucial role of ASAL in the overall development of the country. Apathy rules. If nothing is done on ASAL development, the country will face continuous crises. Solutions require all out effort and not some sector piecemeal approaches. Personnel must learn that they are part of a mission rather than a routine exercise.

Personnel and key actors in ASAL development process must be first made aware of the scope and perspective in other ASAL areas and the surrounding countries to gain and insight into the present conditions, including the process of desertification, the (mis)management of drought, and other factors. Awareness should be followed up by visiting farms in ASAL, who with their own approach and experience have made a success of their undertaking. This must be accompanied by analyses regarding time and effort, farming systems, cost benefits, etc.

An important part of the business of government is to supply information. Donor sponsored programmes must assist the DIDC in obtaining journals and relevant literature, so that staff are kept up to date and able to broaden their view. Staff must also be made to publish on a regular basis. This should not be restricted to personnel with academic qualifications only. Stimulation of peer groups must take place through regular seminars where papers are discussed.

Personnel at all levels are inadequately trained in their own field. Rules of thumb are used in activities that require closer assessment, whereas general aspects where this does apply are not considered. For example, some knowledge about rainfall erosivity, erosion susceptibility, and soil erosion hazard can be broadly applied. Decisions to build soil conservation structures merit due consideration in view of production systems farmers are opting for rather than a uniform approach. In this sense the soil conservation handbook must be upgraded to a standard commensurate with Zimbabwe or Australia.

Whether the above can be achieved through in-service training is only part of the issue. Other members of the Commonwealth maintain an examination system prior to promoting personnel to the next job group. It is highly recommended that the same be done in ASAL to obtain the desired quality.

The catchment approach signifies a collective effort from all parties, and thus by its very nature is multidisciplinary. Also any individual farmer prefers to discuss a range of topics than to be subjected to one specific issue. For these reasons multi-disciplinary training must supplement sectoral training. Personnel must be selected on merit, and those who are chosen be given the proper incentives.

As to qualifications of TA's and SDA's, there is an insufficient basis to build on through in-service training. Present personnel should be gradually phased out, and replaced by personnel with higher qualifications.

REQUIRED INPUTS

1. Selection of sites and optimum size

For lack of a planning base, objective selection of catchments with regard to priority ranking and maximum impact on the surrounding areas is difficult. However, a minimum of basic rules already justify the choices to be made. These are the coincidence of key areas with population density, further taking into account to start from the top downwards. The choice further deals with the vicinity of (cattle) markets, holding grounds, zones of above average production or potential (crops and/or livestock), and miscellaneous areas rich in water. Priority must also be considered with regard to communities/groups generating high input and organisation.

The initial size of catchments should not exceed 500 ha. for reasons of methodical and structural application of the envisaged system. There are also a limited amount of farms or families staff can deal with at any one time. About 80 farms a year is a reasonable limit for experienced personnel. Approximately 20 to 30 farms are ideal for the first and second years.

2. Catchment planning and farm planning

Catchment planning and farm planning ultimately are the product of the community, groups and individuals. Community input is obtained through participative rural appraisal, whereby the staff must draw extensively on local knowledge and lore. For example, the Akamba have their own soil classification system, including the potential and the limitations of the land.

Catchment strategies, plans and maps must be compared with similar plans, previously prepared by consultants of programme staff themselves in order to determine their fit with ecological and environmental rationality, as well as serving as a basis for further dialogue with regard to superior development options. Catchment plans (Scale 1:10,000), prepared by Groundwater Survey

Kenya Ltd. for KIDP, are an example of the latter, representing the physical aspects of land evaluation at the pin point level, and are well on the way to becoming ideal for the purpose.

Subsequent land use planning must include a production strategy and a plan for each farm, which is discussed at the individual level and later with the groups. With reference to communal land, waterpoints, hills, and rivers the issue of their status must be resolved to ensure their long term self sustainability in the rehabilitation and resource improvement process..

3. Legislative options

With reference to Figure 1 farmer groups may eventually develop into organised bodies for the purpose of production and marketing, joint ownership of waterpoints, land credit, ownership of infrastructure (buildings), equipment (tractors), shops, environmental management, etc., provided that conditions permit this development.

Avenues to formalise these aspects into a coherent legal framework must be explored at an early stage for maximum benefit. Legal bodies may be cooperatives, public companies, and a host of alternatives and combinations.

As with land adjudication, it is not important (not even advisable) to immediately establish/implement a legal framework. The desired product must be the result of elaborate community discussion, whereby tangible results of sustained community organisation are evident in the process (i.e. in all activities) of development. Also, in designing a product, relevant traditional law must be blended with the best of civil-, commercial-, and environmental legislation as a basis for new traditions.

4. Research

Research is usually conducted at the national level in isolation by the different institutes. Improved strains, new crops, exotic trees, agroforestry systems, or alternative methods are brought ready made to farmers who have a limited idea what is behind the way of thinking that led to these novelties in the first place. Furthermore, farmers may have different priorities. The adoption of a new crop, species, or technique therefore more often than not rests on coincidence or external factors.

Participative research must be made a major theme of the catchment approach, where farmers, assisted by government, define their own perceived needs and priorities. Broadening their frame of reference by seeing what others are doing (travel), of course, helps. Government should supply groups with information on how to set up trials and how to interpret results, as well as making inputs and tools available. If applicable,

guarantees must be given on buying the produce, which has the added advantage that government and programmes no longer need to concern themselves with the time, cost, and effort of seed bulking for their own demonstration plots and trial. The latter practise should actually be eliminated.

5. Services

For reasons of access during the rains as well as cost, locating nurseries within the catchments is recommended. More important, farmers and groups should be able to select the species of their choice rather than have others make decisions for them. This includes tree species of any kind (i.e., fruits, timber, legumes, etc.). Government must supply inputs and facilities (water), and should further consider making available some funds to a limited number of people who are fully employed in the nurseries. This should further be extended to planting trees for public benefit.

As part of the present KIDP programme vaccination campaigns in the district are conducted free of charge. As part of the campaigns, priority must be given to the catchments, and combined with regular checks and information supply regarding animal health.

Although farmers currently are awarded a plough after building terraces (1 km) on their land, very few are using these for lack of draught animals. These are either too expensive to maintain or funds for their purchase are not available. Findings of a socio-economic profile of Kitui District show that only 3.5% of farmers own a plough.

The easily compactable soils in the district, however, require regular ploughing to make the difference between obtaining a harvest and being faced with crop failure. Moreover, animal traction is not sufficient. Deep ploughing or even deep ripping (soils permitting) is a periodic necessity to enlarge the soil water profile (i.e. to increase effective rainfall). Deep ripping may only be needed once every ten years. Deep ploughing (in excess of 8 inches) must be done at least once every three years.

6. Technical inputs

Technical know how of ASAL dates back to early this century (Australia, South Africa, USA, Zimbabwe, Israel, Kenya), and has become considerable since the 1930's. Yet smallholders in Kenya's arid and semi-arid lands to date have only been marginal beneficiaries of this knowledge, based mainly on the notion that related techniques of high technological inputs are unsuited for subsistence based economies, and that the considerable efforts required thus do not justify the cost. This attitude is reflected in the present day extension messages that are too simple as well as fragmented to have the

desired impact, despite " packing a punch".

The above mentioned view may have held currency in the 1950's, but must be re-examined in the light of the 1990's and the prevailing trends. Also because of this view, development of appropriate technology, relevant research, and adequate supply of information have not merited the attention they deserve. Some examples are as follows:

- There is no reason for uniform application of soil conservation measures. If a farmer in AEZ V on a 2% slope with a sandy loam wishes to grow maize under conditions of minimum risk, he has a right to be told how this can be achieved if he is prepared to bear the cost.

- Knowledge of the production of species introduced for the purpose of re-forestation is sketchy at best. Comparative data with regard to local and exotic species under different conditions are hard to find. Performance of local species under conditions of improved soil water is not known. There are no guidelines for the best species or combination of species to plant under given conditions, at a given time, and at a given place.

- During the past 40 years no new pasture species have been introduced in the district, Napier- and Bana grass excepted, and perhaps Panicum maximum. Adaptive trials to introduce semi-arid pasture legumes (e.g. from Australia or South Africa) are, however, a matter of urgency.

- Individual farmers at their own initiative have experimented by combining pasture and fodder trees or bush in general, with a view on increased biomass production, as well as adding different soil and water conservation measures. Though results are clearer to see, no adequate official notice is taken, and no data are available, the potential importance of such a component in an AEZ V production system notwithstanding.

- The introduction of organic farming is as yet to come. In combination with terracing and ploughing it could probably reduce the risk of crop failure to a minimum, in AEZ V included. It would further enhance the widespread acceptance of zero grazing, thus improving the environment and farm income in the bargain.

7. Training of target groups

Training of target groups may be compared to in-service training with reference to an agreed development strategy, as for example set out in this paper, in order to have the desired effect. A training curriculum must be in accordance with a given sequence of activities and steps denoting the achievement of recognised objectives. Training must be conducted in the field in conjunction with carrying out related activities by specialised

personnel, as distinct from the facilitators who are engaged in community participation.

Training covers a range of themes ranging from administration, marketing, environmental management, legislation, land adjudication, technical know-how and others. Although initially managed by qualified training officers, it is gradually taken over by the community facilitators and members of the communities themselves, as it is a process of years.

As mentioned in an earlier paper (van der Zee, 1991) training of target groups is most effective through the schools approach, since more than 52% of the present population is under 15 years of age. A significant percentage of these children will remain on the land to take up farming. It is also recommended that adult education focus on the catchment approach.

8. Training materials

Present training materials generally cover a limited range of topics and reach an insufficient number of households, apart from being too simple and fragmented. Materials must be changed in accordance with viable development strategies that farmers recognise, and which reflect their own input and perceptions.

The preparation of current materials is further hampered by allocating a minor proportion of development funds to this exercise, and is characterised by underestimating the ability of farmers to absorb complex ideas. Communication is neither simple or inexpensive. Changing farmers consequently first requires changing the attitudes of educators and the priorities of financiers.

The recent production of a manual entitled "Sustainable Agricultural Production in ASAL" for KIDP is a step in the right direction. This must, however, be followed up by a host of similar manuals (cropping, trees, agroforestry, livestock, production systems), the themes of which are comprised in this chapter but also including health, nutrition, construction, and others.

9. Community participation

Community participation erroneously suggests that the initiative to change comprises a set of activities undertaken by government and/or donors. This is exacerbated by community perceptions about the role of government as a leader, which in turn is re-enforced by the attitude of the government's officials.

Community participation is about establishing new traditions (hence

ideology), self management, and self reliance, on the part of target groups and communities it requires trust, a sense of being in charge, an equilibrium between liberty and authority, leadership, courage, and an awareness of the political, social, and economic dimensions of identified goals to mention but a few. On the part of government and the donor community, it requires people who know what they are talking about, a full commitment right down to the individual level, a natural ability of facilitators to communicate, and personnel presenting themselves as servants of the public interest rather than members of a ruling class. All parties must be aware that the products of community participation more often than not clash with the political interest, and at times even with the interest of government.

A successful participation methodology is not easy. It is a process of mutual learning, whereby mistakes are inevitable and where the above mentioned conditions are hardly ever present in the beginning. Furthermore, what is good for Sao Paulo most likely is not suited for Kitui. It is therefore not surprising that places where participation is seen to work, are few and far between.

The foundation of a viable model must originate with government at the district level, involving all departments under the leadership of the DDO. It requires a joint vision, incorporating a knowledge of the district's potential and limitations, about all facets of development. Apart from lacking a planning base the most difficult part in such an exercise concerns an understanding between the different disciplines and individual ideologies. Not everyone has an appreciation of ecology or the wish to alleviate or eradicate poverty.

Presuming that designing such a model is indeed a possibility, this initially (as e.g. also this paper) only serves as a frame of reference for the facilitators in their dialogue with the identified groups at the catchment level. The mutual exercise of fitting perceptions into an agreed strategy will generate a logical framework, a plan of operations, and subsequent workplans. As from then onwards projects or programmes can embark on a road loaded with pitfalls, guided by Freire, and applying the necessary modifications (evaluation and monitoring) on the way.

TOWARDS COLLECTIVE SELF RELIANCE

Figure 3 shows a number of steps that have led (and are still in the process) to development of an area and its people in the province of Choco, Colombia. With some modifications it can be imagined that a similar process may apply to the catchments of Kitui, and eventually the district.

From this figure it can be seen that the final objective is to generate definite changes in the socio-economic, technical, administrative, and socio-cultural

climate. With reference to the organisational base the first step towards this goal is the formation of cohesive groups, with their own ideas about development. Pre-requisites concern an organised production and marketing system, obtaining surplus, investment in agro-industry, and the development of ancillary activities which pertain to training and community organisation. It must be noted however, that in Kitui there may be a different scenario, although this is doubted. Underproduction and underemployment are issues of paramount importance to the community and need to be addressed.

The second step is dictated by the formal organizations of different kinds growing out of the first step. These organisations most likely will be production oriented, but may also deal with the environment, land, or education. Investment of surplus in shops, health, or other needs serves to strengthen the organisations.

The third and determining step to reach the ultimate objective, is the final push towards economic and social development. This may generate, for example, creating a water authority, land use authority, or a catchment authority comprising tens or thousands of hectares. As to the management of land and water catchment authorities actually transcend the present laws.

INSERT FIGURE 3: REQUIRED STEPS TO REACH THE DESIRED DEVELOPMENT

COSTS AND BENEFITS

A minority of people, mostly engaged in the technical aspects of ASAL, claim that development of Kenya's arid and semi-arid lands is a financially viable proposition. A majority of economists, policy makers, and donors with little experience in the relevant field, claim that generally ASAL holds no future. With a view on the latter philosophy it appears that funds for ASAL are made available on the same grounds as the permanently employed in the developed world receive their benefits. However, half hearted attempts are self defeating, and furthermore cause donor fatigue.

Presently neither opponents nor advocates are capable of presenting a valid case. Analyses based on the past and present poor ASAL performance and present trends implicitly ignore a lack of vision and poorly formulated programmes as some of the root causes. Positive experiences like ALDEV in Kitui are also ignored. There are few case studies in the developing world regarding the cost benefit aspect of soil conservation (Pagiola, 1991), which, moreover, are largely speculative as well as subsistence oriented. Without discounting their value, cost benefit analyses are needed for an improved system, of which terrace building is but a component. If no data are available, at least drawing up a number of scenarios will help to obtain an idea of inputs, costs, and projected benefits.

Calculations of costs and benefits must further give consideration to three scenarios with regard to trends. The first of these is the "Ethiopia scenario", which under the circumstances is a probability if present Kitui trends continue. The cost of social upheaval, political unrest, and resettlement must be included.

The second scenario concerns present inputs in ASAL and the returns these are yielding, i.e. basically the sectoral approach. The third scenario concerns a cost benefit calculation by taking the systems approach. Undoubtedly the costs will be high. But what is at stake are the benefits and not what donors are willing or can afford to pay.

Farmers and nations in general are prepared to go to great lengths for the sole purpose of feeding themselves, and defying any monetarist's comprehension in the process, whilst achieving results no one imagined. The case study of Kambiti Farm in Machakos District as described by Mutiso and Mutiso (1991) is a local example. Israel and the Netherlands are full of similar examples. They flourish. Kitui can also flourish.

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PART FOUR: THE NATURAL RESOURCE BASE

LIVESTOCK IN KITUI

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1. INTRODUCTION

Kitui district has a long history of livestock production. In the days past, when the human population was low, many areas of the district were used for pasturing cattle and goats. Nomadic pastoralism is now left only in the Eastern parts of the District. The general livestock situation and its relative importance vis-a-vis crop agriculture has been changing with time. This paper is written with the intention of stimulating discussions on the future development of this important industry.

2. THE NATURAL RESOURCE BASE

The two most important natural necessities for livestock production are water and feed. Both depend on the climate which also influences vegetation on which livestock thrive.

Kitui is a large district (31,000 sq. km.) which has large flat areas. The rainfall varies with relief and is highest in the hilly areas of Central, Kwa Vonza, Eastern and Mutomo Divisions. The average annual rainfall realized in these hilly areas ranges between 850 and 1000 mm. It is however, subject to variations. The flatter areas vary in altitude also and they receive not only much less rain but the rainfall itself has a very low reliability. Although old rainfall records show that the district has a bi-modally distributed rainfall, the short rains have tended to be more reliable than the long ones. The rainfall in the lowlands ranges from 450 mm. in the dry eastern rangelands to 800 mm. in the sunflower maize zones.

The vegetation, as in other areas, is dependent on rainfall and soil types. The original vegetation of most parts of the lowlands was grassland with a few trees mainly along the water courses. This has now changed through man's influence (cultivation, overgrazing etc) and what we see today are grasslands with lots of bush and little grass cover. The denuded grasslands still retain the capability to recover if rested but the current population densities do not permit such rests. Soil conservation measures will need to be applied and in some cases (on private land) re-seeding will need to be done. As is mandatory elsewhere, protection of the land being rehabilitated from livestock will need to be effected or else all the reseeded efforts will come to nought.

Kitui has many important grass species e.g. *Chloris roxburghiana*, *Eragrostis superba*, *Cynodon dactylon*, *Cenchrus ciliaris* and *Aristida* spp. Its woody species include various species eg. *A. mellifera*, *A. tortilis*, *A. senegal* and others like *Balanites* spp, *Grevia* spp and *Commiphora* spp. Most of these range species are browsed by goats and grazed by cattle and are the basis of livestock industry in Kitui

Kitui district can be divided into seven agro-ecological zones (see table 1). These zones are based on rainfall, its reliability, altitude and other aspects e.g length of growing season. They indicate the agricultural potential. According to this classification, about 85% of the district is suitable for either livestock alone or in combination with drought resistant crops like millet. The better zones (15 % of the district) are suitable for food and commercial crops. In these areas, livestock are also kept but they face a lot more competition from food crops like maize and beans than from coffee and cotton which have of late been bedeviled by marketing problems. The budding Kitui dairy industry is also based in the same favourable zones. Cultivation for food crops has been extended to the less favourable zones and although it is seen as a food security matter, the reality is that the crop failure rate is so high that it would have been better to leave the grass for livestock. In the lowland ranching zone, cultivation except in flood plains is useless. Water for livestock is scarce during the dry season and the only advisable land use is what the people are doing, namely nomadic pastoralism.

Table 1
Agro-ecological zones of Kitui District.

Agro-ecological zone	Area	%
Um 3-4 Transitional coffee zone	69,000	0.34%
Um 4 Sunflower - maize zone	275,000	1.37%
Lm 3 Cotton zone	25,000	0.12%
Lm 4 Marginal cotton zone	2,553,000	12.71%
Lm 5 Livestock millet zone	9,380,000	46.70%
L 5 Lowland livestock/millet zone	786,000	3.91%
L 6 Lowland ranching zone	6,996,000	34.83%

Source: Olang and Maritim (1986)

3. THE PRODUCTION SYSTEM

Due to rainfall limitations, the district has a very limited number of systems of livestock production

1. Mixed farming

Most Kitui farmers can be regarded as mixed farmers since they grow crops and keep some livestock. The number of livestock kept by these farmers is variable and it depends on the agro-ecological zone which is also correlated with the size of holding.

In better endowed areas, farm sizes are small (about 2 acres per family) and the land set aside for grazing is very small. Cattle kept are few (usually 1-2 cows, 1-2 oxen for ploughing and a few goats. Both cows and goats are tethered.

In the drier areas of the "mixed farming zone", farm sizes are larger (up to 15 acres per family) and the herd sizes are accordingly bigger. Livestock are herded during the wet season, but during the dry season they are let to pasture on their own. This practice called " Kulekya" is a problem to fruit tree growers and farmers using bench terraces as soil conservation measures. It is also a hinderance to good livestock disease control.

An important subset of mixed farming is dairy cattle husbandry. This has started picking up in the parts of Matinyani, Mulango, Changwithya, Mutonguni and Migwani locations. Dairy cattle are fed fodder from planted pastures (napier grass mainly), allowed to graze natural pastures and also fed crop residues e.g. maize stover (" mavya ").

2. Ranches

Kitui has 15 ranches (4 co-operative, 1 DAC, 1 private, 1 individual, and 8 group). Although most of them are large (greater than 1000 acres), the official stocking rates in most of them (except B2 Yatta and Mwakini) are low. The unofficial stocking rates (composed of member's stock and illegal grazing) are high and in some cases e.g. Mwakini have led to general overgrazing. Livestock and pasture management, as well as illegal grazers, are big problems.

There are other smaller ranches owned by a few people in Kitui (in Kavisuni/Kanyangi/Mbitini) but as a land use, ranches are owned by a minority.

If well managed, ranches can be an important source of meat animals. They are mostly established on the western frontier with Machakos district and need protection from disease carried by livestock.

With the general collapse of group - ranches elsewhere in Kenya, it is debatable if the Kitui group ranches will stand. At any rate it is highly unlikely that more ranches will be created.

3. Nomadic Pastoralism

In the Eastern, North-Eastern and Southern parts of the district, farmers practice a form of nomadic pastoralism. These areas are used during the rainy season when water is found in depressions and in the seasonal rivers. When the areas dry up, the animals are moved to areas where water can be found. These areas used to be pastured by all people but of late, some people have started settling. Insecurity from bandits and general water shortage (aridity) limits the use of this area and we may start seeing localized deserts around areas with permanent water.

In common with other communally grazed areas, pasture improvements and water facilities are not developed. It is a serious environmental question as to whether such areas should be settled or worse still whether water should be developed.

4. LIVESTOCK TYPES KEPT AND POPULATIONS

The inhabitants of Kitui district keep virtually all the common rangeland livestock types i.e. local cattle, sheep goats and poultry. In the wetter areas, dairy cattle are also kept and in the areas near towns, exotic poultry are kept. These exotic livestock are, however, a small minority.

Estimates of livestock populations in Kenya are made by the officials of the Ministry of Livestock Development and are usually projections of an earlier estimate basing the increases on predetermined growth rates e.g. 5% for cattle. These estimates can be erroneous, but since it has not been possible to conduct censuses often, we have no more reliable estimates than these.

Table 2 shows livestock population estimates of ruminants and donkeys. The only data set for which credibility can be attached is the 1986 one. During this year, as was the case in many other Kenyan districts, a livestock census was carried out with the aim of estimating the effects of the 1984/85 drought and to provide a situational picture.

The data presented in Table 2 shows that the district has:-

- a) A relatively small population of dairy cattle.
- b) A sizeable population of beef cattle
- c) A large population of goats
- d) A relatively small population of sheep

Table 2
Livestock Population in Kitui District

Year	Dairy	Beef	Goats	Sheep	Donkeys
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CattleCattle

70	158	500,000	400,000	300,000	-
71	170	500,000	328,297	300,000	-
72	186	498,000	450,000	350,000	-
73	238	503,000	451,200	352,000	-
74	250	300,000	450,000	235,000	-
75	275	405,000	700,000	405,000	-
76	86	269,369	305,074	77,706	-
77	235	251,945	350,000	80,000	-
78	300	280,300	450,000	70,800	-
79	-	300,000	400,000	115,000	-
80	-	207,717	284,043	78,296	-
81	1,000	202,000	298,000	82,000	-
82	500	221,000	297,000	81,500	-
83	-	220,800	285,000	79,000	-
84	-	288,678	373,880	80,000	-
85	730	192,145	289,765	47,100	-
86	4,970	293,670	427,932	60,070	38,600
87	5,800	304,300	534,500	68,500	47,080
88	6,700	327,900	621,755	75,403	49,434
89	7,000	363,290	516,690	64,800	34,960
90	7,735	344,040	660,047	64,899	56,100

Source: Gitu et al. 1986. Annual Reports, MoLD Kitui.

a. Dairy Cattle

The data on dairy cattle population before the 1986 census were unreliably estimated and as such they cannot provide a trend in development. The data from 1986 onwards is reliable, according to the D.A.P.O (Kinoti, personal communication). It shows that dairying is picking up slowly but steadily. Dairy cattle are now found in the wetter parts of Central, Kwa Vonza and Mwingi divisions while in other areas, (Kyuso and Mutomo), farmers are now making important strides in preparations of their land for dairy cattle.

Considering the land potential, the high milk prices (about Kshs. 7 per litre) the dairy population should be higher. Reasons advanced to explain the low adoption rate include problems with tick-control and small size of holdings. A lot of interest has been indicated in obtaining material for planting pastures but this has yet to be translated into action since even when the planting material is taken nearer their farms the budding dairy farmers do not use all of it. It is likely there is an issue of prioritization and this will be sorted out with time.

AI is unlikely to assist in the dairy herd expansion and since earlier bull

schemes have also failed, private farmers will have to co-operate to operate their own schemes as bull stations.

Dairy extension should continue to be supported as dairying can improve incomes of the small scale farmers. AI runs are making no impact due to the very poor response of the farmers. The AI vehicles should be used in extension. Some ranches e.g. B2 Yatta should be encouraged to breed crossbred dairy heifers for sale to local farmers. Co-operating farmers should be encouraged to form groups of friends and share bulls and to cleanse them of ticks.

b. Beef Cattle

It is apparent that the beef cattle population has been going down and this drop occurred before the 1984/85 devastating drought. The reasons for this drop are likely to include droughts which have been hitting the district quite often, devastating diseases and the dwindling sizes of holdings. Droughts are likely to have been the most important cause and livestock are more likely to have been reduced through either sales for food and school fees or sales to save the investment for total loss that drought can cause. As is usual with people of low income, the money from sales is spent on other necessities and when the drought ends there is no money to restock the cattle. There are many unconfirmed stories that many farmers who had no alternative sources of income sold their cattle when they sensed that the last drought would not abate soon and are now without livestock.

A serious problem related to the dwindling cattle population is the shortage of oxen for ploughing. This has reduced the chances of poor families' providing food for themselves since they have to wait for others to plough even as the short and unreliable Kitui rains progress.

c. Goats

Like beef cattle, the numbers have also been reduced although as expected, from their high reproduction rate, they are rising again. Goats are easily devastated by CCPP, Anaplasmosis and ordinary pneumonia, but even without disease, they are the most sold livestock thereby acting like a "current account". Droughts are likely to have affected them through sales to get money for food purchases. Farmers in the higher potential areas keep very few goats and as the holding sizes have been shrinking due to subdivision, the goat population is also shrinking. Restocking after drought is normally based on goats as they are more affordable than cattle. When the goats increase they are sold to provide money for purchasing cattle. Goat populations include the famous white Galla types which have a larger mature body weight than the ordinary small East African goat.

d. Sheep

Sheep for social reasons which include "witchcraft" are much fewer than goats. Their population has also been going down and one wonders if the population ever reached more than 100,000. Promotion of improved types e.g, Dorper may not be effective as sheep are not a highly preferred livestock type. An exception is made for the large Christian communities but these unfortunately are in the high potential areas whose grazing land is small.

e. Poultry

Kitui district has a significant local poultry population of 1,200,000 birds. These birds provide eggs and offspring which are sold for cash. Although individual flocks are never very large, the income generated compares very well with that from goat sales! Poultry keeping is done by women generally and besides providing independent cash (from their husbands) it is important in kinship bonding through donations of pullets to young relatives and slaughtering birds for visitors. Of course family members also eat the birds.

Improved poultry forms a small but significant proportion of the total poultry in Kitui. There are about 5000 hybrid layers and many more products of the Cockerel Exchange Programme (CEP) of the NPDP project of the Ministry of Livestock Development. The results of the CEP programme, fast growing crosses, have been demonstrated in the field Kitui. Mutomo, Central and Mwingi divisions have benefited from the Mutomo rearing unit. Mutito division is about to start a rearing unit.

There is a current shortage of eggs in the district and as such poultry development should get assistance.

f. Donkeys

These are the most important beasts of burden in the district. Almost all families in the dry areas yearn for a donkey for drawing water. Donkeys unlike other livestock species do not suffer from any devastating diseases and as such their population can be expected to increase, but unlike other livestock, their parturition intervals are long.

5. CONSTRAINTS AND POSSIBLE REMEDIES

Size of Holding

The normal increase in population due to births coupled with immigration had resulted in too dense a population for a relatively dry area. This pressure is highest on the Kitui hills which are wetter than the lowlands.,

The first production priority for a family is to provide food. This is usually maize, beans, cowpeas, pigeon peas and millet. The land is used for crop growing and if some portion remains, it can be used for grazing. Spare land has been difficult to come by and this land shortage is constraining dairy and other types of livestock production.

A short term solution is to intensify livestock production. While family planning attempts to contain the current growth rate, farmers will have to intensify using low cost techniques and using their own labour as much as possible. Intensification will lead to more tethering of livestock and stall feeding in some cases.

Water

Kitui is the source of important rivers like Tiva, Thua and many other smaller ones. The Tana and the Athi rivers, the largest in Kenya, form the boundaries with Embu, Meru and Machakos. The water table in parts of Central Division is shallow. The big water courses are however, far apart and the areas between them have hardly any water during the dry season. It can be said that there is enough water in all the water courses in the district but the major constraint is affordable technology to tap and distribute it.

Water shortage is very common in the rangelands and this affects livestock husbandry as watering during the dry season has to be done every 2-3 days in some areas. The same water shortage has made it very difficult to establish dips for tick control. Exotic livestock which require water more frequently than the local types cannot be acquired and maintained in many areas. It is therefore necessary to develop water facilities to assist livestock development.

Kitui has a long history of water development using rock catchments e.g. Ngomeni dams and weirs, but most of these are in a state of disrepair. It may be about time that farmers were encouraged to make their own hafirs and be shown how to maintain them since most public water facilities tend to be neglected by beneficiaries. Assistance in siting dams should be given by experts. Proper surveys to allow livestock access to public water sources e.g. dry river beds, dams etc should be done as without these, livestock in future may have no access to rivers. Co-operation among all the agencies involved is vital.

Bush Encroachment

The original vegetation of most of Kitui plains was savanna with lots of grass and few trees except along the river courses. When properly utilised, burned strategically, bush does not constitute a big problem. However, when

overgrazed, bush starts taking over from grass and it has to be cleared taking much energy and or expense. Most of the ranches in Kitui have a bush problem and even the small farms are not spared.

A number of solutions can be proposed. One is utilising of browsers like goats and camels. Goats handle bushes upto their "extended heights" beyond which they can do nothing. This is evidence by the fact that there is bush even in the areas keeping goats. Goats can do a good job but they will need to be assisted by man to prune or to selectively clear the bigger, taller trees in order to allow grass growth.

Camels, like goats are good browsers. They can control bush to a certain degree, but their browsing habit is such that they feed on very many plants and never browse on a particular plant to the degree that the plant can die. They can be adopted in areas with large farm sizes e.g the Eastern rangelands where they can also fit better due to their ability to stay without water for up to 10 days.

For other areas, man has to clear the bushes before they become trees. This can be done by using fire judiciously. Some of the big trees can be used for charcoal burning. The current laws do not permit tree felling, and will have to be modified or else bush will be so perfected that it swallows all the pasture and tsetse flies come to the farmers' doorsteps.

The ultimate solution is to control grazing pressure by destocking overgrazed areas. This can come through a long term extension/education programme. Excess woody species will always need to be cleared early. The current low livestock populations may be a blessing in disguise and the extension services should take the advantage to extend range improvement messages,

Livestock Diseases

All major livestock diseases such as Anthrax, Black Quarter, Trypanosomiasis, CBPP, CCPP, East Coast Fever, Anaplasmosis Foot and Mouth disease and Lumpy Skin Disease have been reported in the district at various times in the recent past. Some of the diseases can be prevented through vaccinations (CBPP, Rinderpest, LSD, Anthrax) while other cannot be prevented in the same manner.

The control of diseases through vaccination is successful if:

- a. All the animals are vaccinated.
- b. Animals in the neighbouring districts are also vaccinated.

In the case of Kitui, there has never been enough funds and possibly personnel to allow a coverage of all the animals (or even cattle). The funds available have allowed a coverage of 2-3 divisions per year at most. This has

reduced the effectiveness of the whole exercise as the animals in the unvaccinated areas keep on mixing with the vaccinated. The neighbouring districts of Tana River and Garissa are the sources of some of the livestock traded in Kitui. It is known that vaccination in these two districts is even more problematic than it is in Kitui. The result of this poor state of vaccination is that many Kitui animals are attacked by many diseases which can be prevented. It would be advisable to give adequate funding to cover all the cattle against all notifiable diseases or else the current piecemeal coverage may not be worth the effort.

Immunisation of goats against CCPP is also problematic since, unlike cattle, there are usually no crushes that can be used to restrain them. Besides, the attitude of the pastoralists is to protect cattle rather than goats. Before enough extension has been done it may be a futile exercise to immunise goats.

Tick control is a complex problem in Kitui because of the lack of water for dips. Spraying against ticks is the only viable solution. Spray pumps and acaricides like Triatix^R are expensive. Farmers will need to co-operate in the purchase and use of spray pumps and also share labour. There is also an opportunity for local enterprising young men to buy spray pumps and spray farmers' cattle at a fair cost. Such men already exist in parts of Central Division where they help in tick control of goats owned by women's groups.

There is a tendency for pastoralists in Kenya to treat their animals usually with the miracle performing terramycin and berenil. This tendency is known to create resistance to disease due to underdosing. Veterinarians should keep on instructing on the correct dosage through group meetings or demonstration. Some local people should be instructed further to act as "village doctors" but also to maintain contact with AHA's and Vets for difficult cases.

The status of disease reporting especially where epidemics are involved needs to be improved. Provincial administration should be able to assist in passing this information as well as assist in the law enforcement relating to quarantines. Vets need to be fully prepared to cope with epidemics and for this reason support in form of transport, fuel, drugs, etc should be availed. The support should be related to livestock populations and the vastness of the district. There is a current shortage of vets and other livestock disease prevention staff. This shortage is caused by reasons beyond the district control and is even an important reason why vehicle, fuel and drug support should be intensified. KIDP is assisting in the construction of offices and labs with facilities. These will be utilised better if transport to reach the foci of disease outbreak can be improved. Other government departments can also assist with vehicles when there is a disease outbreak.

Livestock Marketing

Although livestock marketing is generally a constraint to livestock development in other parts of Kenya, there is not sufficient quantitative marketing data to show that it is a constraint in Kitui. We have, however, verbal reports indicating that it may be so and we are aware of the market organisation and problems which we can discuss under this heading.

A number of questions can be posed and their answers, if known, lead us to the knowledge of the situation pertaining to livestock marketing in the district. Those questions include:-

- a) Are there any livestock for sale in the district?
- b) Do Kitui livestock keepers sell livestock in excess to their needs or are they such lovers of livestock that they cannot countenance selling?
- c) How are livestock marketed in the district, how is the marketing organized and are there enough marketing places and other support facilities to enable producers and sellers to get fair prices?

The answer to the first question is not straight forward. The livestock populations indicate that if we assume a normal off-take rate of 10 - 15%, we can expect between 34,000 and 52,000 beef animals to be sold in a year. Such numbers cannot be regarded as high enough to attract many buyers in the year but are high enough to warrant an efficient organization to benefit producers. The numbers are too low to warrant the construction of elaborate sale yards for if the cess per animal is about Kshs 30/=, the expected revenue would be Kshs 1.5 million if they are offered in the first markets. Assuming that half of them will be resold at the secondary markets, the gross revenues are likely to be about Kshs 2.3 million per year. Not all the cess payable is paid and hence the realised cess could be about Kshs. 1.5 million.

There are many more goats than cattle. With an off-take rate of about 20%, about 130,000 goats can be sold through the markets. Assuming a cess of about Kshs 5/= each, about Kshs. 0.5 million can be realised in cess. With the combined estimates of beef and goats, it would appear that the district has livestock for sale.

Kitui livestock keepers have a sale custom and if the prices are fair, they sell their livestock readily. The sales are prompted more by needs than by prices. These needs are in form of school fees (Kitui farmers value education) and food purchases (the unreliable rainfall necessitates lots of livestock sales). Mixed farmers usually sell their mature ploughing oxen and buy younger ones to train for ploughing. The excess cash generated is used for other family needs. Some of the young bulls offered for market are not sold out of the district but to other farmers, who buy them in the markets. During drought or when threatened by epidemics, Kitui farmers sell a lot of livestock and are usually unable to replace them after droughts or epidemics.

Marketing Channels and Organisation

Kitui livestock is marketed through both official and unofficial channels. Livestock, especially in the areas far from market centres, (and there are many such areas in the district), are first offered to local or itinerant traders who buy at the farm (boma) level. If the price offered is acceptable to the owners, the traders buy them and trek them to either the scheduled market areas or to other areas where they may have orders. If no trader offers an acceptable price, the farmer normally treks the animals to the nearest scheduled market centre unless they have prior information indicating that prices at another market are better.

The district has 14 scheduled market places at Nguni, Tseikuru, Mwingi, Migwani, Kabati, Tulia, Mutito, Zombe, Nu, Endau, Kalundu, Kisasi, Kavisuni and Mutomo. These markets may appear many but considering the vastness of the district, one can see that some parts of Yatta plateau and in the southern division (Mutomo) are quite far from the scheduled markets. These scheduled markets serve as primary, secondary and even final markets depending on the location of producers and sellers.

Wealthier traders tend to concentrate on a few important markets like Nguni, Kisasi and Kalundu. They, however, have contacts with small scale traders who buy animals at the smaller markets. Livestock is also moved from one important market to another important market depending on prices. Butchers also buy slaughter livestock from both farms and markets. They also form an important channel. Purchases made in the final markets can be transported in lorries or be walked to their destinations. Lorries are usually preferred by disease controllers.

Final Destination and Stock Routes

Kitui livestock usually ends up consumed in various areas including Nairobi, Meru, parts of Central province and even in Mombasa. The stock routes are generally two, one from Tana River through Kakya-Mutha to Kisasi and another in the northern side, Garissa, Bangale, Nguni, Meru or Nairobi/Central Province via Thika. The livestock sold in Kisasi can be resold in parts of Machakos district including KMC Athi River or be slaughtered in various Nairobi abattoirs. Some may also end up in Mombasa. As mentioned already, the routes taken by the traders are many and in some cases livestock move from Nguni to Kisasi and then to Nairobi or Mombasa.

Stock routes in Kitui are known but no facilities like water points are developed. This lack of water results in excessive weight losses which are in turn reflected in poor prices.

Marketing Facilities and Organisation

Most markets are underdeveloped. There are neither auction rings nor places to restrain livestock during sales. The collection of cess and the examination of livestock for diseases are very problematic. It is estimated that the Kitui County Council collects only 20-30% of all the livestock cess due to it, owing to poor marketing infrastructure. No price information is given to sellers and this results in exploitation by middlemen.

Price Determination and Levels

Virtually all the marketing is by private treaty as no functional auctions exist. Prices received depend on seasons and more on whether there is a general food shortage or not. School fees also tend to depress prices. The levels received are considered low for the sizes of animals and it is felt that the markets should be better organized to assist the producers.

Some Estimates of Offtake

The data relating to official marketing (see Table 3) indicate low offtake rates in 1988 and 1989. The data for 1990 shows too high an offtake and it is suspected that the number includes livestock from other districts e.g. Tana River and Garissa. The data on hides and skins indicate either a lot of unofficial marketing, home consumption or high livestock deaths.

Recommendations

1. Livestock marketing may or may not be an important constraint in Kitui. This can only be established by a detailed study which should look into all aspects.
2. The current staffing of the section on livestock marketing is too low to collect all the necessary data. It would be admirable that the officials of Kitui County Council train enumerators to collect data on marketing. Information to be collected should include livestock numbers offered, numbers sold and average prices realised. This data should be analyzed to shed light on the marketing operations.
3. The newly started auctions should be monitored by both MoLD and Kitui County Council officials. If proved successful, new markets should also have auctions. It is necessary that the auctions be studied in one or two markets as in other parts of Kenya they do not function well.
4. Livestock price information and livestock numbers on offer should be communicated through radio to make buyers aware of the possibilities of trading profitably with Kitui livestock.

5. Possibilities of slaughtering in Kitui or Mwingi and transporting the carcasses in registered vans should also be studied. This seems to be preferred by the Nairobi market which increasingly is supplied by butchers who slaughter in places like Namanga, Tala and many small trading centres in Kiambu and transport the meat to Nairobi.

6. The establishment of holding grounds in Kitui should be shelved as there are no livestock to use them. The current ones are rendered useless by lack of facilities and illegal grazers are a menace.

7. Disease control should be intensified as in the past FMD and CBPP quarantines have constrained marketing. Co-operation between various government departments especially, provincial administration and MoLD, is vital in the enforcement of quarantines.

Table 3
Livestock Marketing Data

Year	Slaughter and export			Hides and skins		
	CattleOff Take	GoatsOfftake		CattleGoats		
1988	15,882	5%	44,423	7%	19,542	159,716
1989	31,518	9%	62,613	12%	21,553	193,728
1990	108,666	30%	105,719	20%	18,391	143,550

Sources: LMO, Annual Report 1988
PLMO, Eastern Province, Annual Report 1989
DRMO, KTI, Annual Report, 1990

6. CONCLUDING REMARKS

Livestock development in Kitui is bedeviled by many problems some of which are within the capability of the district to solve. Disease control (not cure) should be emphasized. The status of disease reporting and the capability of vets to contain epidemics should be enhanced. Information on livestock marketing is incomplete and is needed urgently as the current picture is very unclear. A livestock census would help, failing which the officers should collect more data for planning purposes.

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PROMOTION OF OIL CROP DEVELOPMENT

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1. INTRODUCTION

Oilcrops may be defined as plants cultivated for the purpose of producing vegetable oils for domestic use, manufacture of cosmetics and industrial use. In most cases, palm oil is a notable exception, the residue from the oil extraction process is a cake of relatively high protein content, which can be used for human food, fertilizer, and animal feed - the major use. However, there are important oils and cakes which are obtained as by products of other industries. Cotton cake, from the ginning of cotton seed for fibre; and maize oil, from the germ collected during maize-milling are examples.

Oils and fats form an important part of a balanced human diet. Traditionally, most Kenyans obtained their requirements from animal sources or through the direct intake of oil-bearing crops. The consumption of refined oils and fats is a relatively recent dietary habit among Kenyans, introduced after the arrival of the European and Asian cultures in Kenya. Indeed, vegetable oil/fat consumption in Kenya has increased only over the last two decades, rising from a per capita rate of 1 kg per year in 1970 to the present 5 kg. Consumption is, however, growing fast, and is projected to reach around 6 kg per capita in the next 10 years (see VOPS, Working Paper No. 8). Factors behind this rapid growth in vegetable oil consumption include: 1. the fast population growth rate, 2. changing of consumer tastes for fried foods and snacks, 3. urbanization, 4. less availability of animal-fat substitutes and 5. overall increasing family incomes.

The present per capita consumption suggests a national demand of about 110,000 metric tonnes (m.t.) per year taking Kenya's population to be 21.4 million people. Yet, Kenya produces only around 20,000 m.t. of edible vegetable oils per year. The balance is met from importation, mostly of palm oil. This importation of mostly crude (but sometimes refined) oil means that a significant portion of the by-product feed cakes also have to be imported. More importantly, the annual import bill of about Kshs. 2.0 billion for the vegetable oils plus a further Kshs. 0.5 billion for 3,000 m.t. of the feed cakes is a major drain on the country's foreign exchange. In fact, edible oil importation is the single largest bill for agricultural imports.

Given the above scenario, the case for Kenya to increase domestic production of oil crops becomes obvious. Apart from savings on the nation's meagre foreign exchange, such a policy could have these additional

benefits:-

1. increase caloric intake from oil fats. Kenya's present per capita is well below the world average of 14 kg per capita per year;
2. greater availability of the animal feeds for the livestock industry (mostly dairy, poultry and pigs);
3. fulfilling Government's own stated policies of food security (see Food Policy Paper, 1981), narrowing of the gap in oil crops trade (Sessional Paper No. 1, 1986) and promoting off-farm employment opportunities from domestic processing (Sixth National Development Plan, 1980/93). Where processing takes place at farm, trading centre or village levels, this would boost rural industrialization.
4. reduction of the uncertainty connected with dependence on foreign suppliers and markets which are characterized by volatility and inelastic supply (thus small reductions in output, say from bad weather or protectionist policies of producers, lead to greater than proportionate increases in prices). To the extent that Kenya's national import is only a small fraction of the world trade in this commodity, we are "price-takers".

2. POTENTIAL FOR OIL CROP PRODUCTION

Available information suggest that practically each district in Kenya has the ecological potential for one oil crop or another. Coconuts dominate in the Coast Province, where they grow naturally, while groundnuts are grown mostly in the Lake Victoria Basin districts apart from smaller amounts in Meru and Embu districts. Simsim is again prevalent in some Coastal Districts (Kilifi, Kwale and Lamu) and in the Western Province (Bungoma and Busia). Sunflower has a much wider ecological distribution but is more prevalent in Eastern Province (Machakos, Kitui, Embu, Meru), and in the lower elevations of Kirinyaga and Bungoma Districts. Cotton seems to follow a similar pattern, while rapeseed is mainly a high potential area crop, where it can actually compete with wheat and barley, depending of price regimes. Castor oil is grown in the more arid districts of Eastern Province, Kitui included.

Estimates of the total area planted to some of the crops are given in Table 1 below.

Table 1
ESTIMATED HECTARAGE UNDER VARIOUS OIL CROPS

Oil Crops	Area (ha)
Cotton	45,000
Sunflower	42,000

Groundnuts	39,000
Coconut	35,000
Rapeseed	4,700
Simsim	4,600
Soyabean	2,000
<u>Castoroil</u>	<u>n.a.</u>

Total 176,000

Source: VOPs, op.cit

It is important to point out the unreliability of some of the above hectarages, which additionally mask very great variability from year to year. However, the important point is that Kenya has the potential for the production of both annual and perennial oil crops. Except in the case of rapeseed, this potential is to be found in the Arid and Semi-Arid Lands (ASAL) simply because current land holdings tend to be larger and also because of unavailability of alternative high-value cash crops. Most of the cultivated land in the higher rainfall areas which can be allocated to non-food crops is already under high-value cash crops such as coffee, tea, pyrethrum and horticultural crops.

3. CONSTRAINTS OF OIL CROP DEVELOPMENT

Why has not a thriving domestic oilcrop industry developed in Kenya? Basically because of the availability to the processing industry of very cheap alternatives in form of imports, combined with a lack of a clear public policy for the industry.

1. Prices of Imports.

Of the 90,00 m.t. of vegetable oil which Kenya imports, about 80,000 m.t. is palm oil. Why the dominance by palm oil? Well, the international prices of this commodity (as actually is the case for other major vegetable oils like rapeseed, soyabean and sunflower), has been on the decline since 1983, when they peaked. Between 1983 and 1988, the prices declined as indicated in Table 2.

Table 2
INTERNATIONAL PRICES: FOUR MAJOR OILCROPS 1983 & 1988 US\$/M.T.

Crop	1983	1988
Rapeseed	696	297
Palm oil	767	310
Soyabean	722	324
Sunflower	765	354

Source: VOPS, Working Paper I.

Thus, the oil industry imports the second cheapest vegetable oil. Moreover, palm oil contains saturated fatty acids (and is therefore dietetically less wholesome) which means that only minimal hydrogenation is necessary to turn the oil into fats and thus increase the shelf-life of the final product. Further, due to the public policy of "protecting the consumer"(mainly the urban consumer), the Government has been reluctant to impose any restrictions on palm oil imports and, when any duty has been imposed on the imports, the Government, which partly owns the largest processing plant, gives 100% remission of the duty to the processor.

This subsidization provides no economic incentive to the processing industry to support domestic production of alternative oil groups.

The declining price of the imports has afforded the processing industry substantial profits. Margins have even remained high, when the price of the final product to the consumer has remained nearly constant or even have declined.

The following table compares the estimated variations in the imported prices of palm oil (including import duty) to the price of Kimbo (the best selling vegetable fat.)

Table 3
LANDED PRICE OF PALM OIL VS PRICE OF KIMBO 1982 to 1986

Price of (Ksh/kg)	1982	1983	1984	1985	1986
Palm Oil	16.90	12.80	10.00	10.00	8.00
KIMBO	17.50	18.80	20.50	21.00	22.50
Margarine	10.60	6.00	10.50	11.00	14.50

This table reinforces the conclusion above.

In fairness to the industry, it should be pointed out that in the late 1970's, the Oil Crop Development Ltd. (a subsidiary of EAI) did attempt to promote the production of sunflower (among others) by distributing free seeds, fertilizers, and offering oil crop-targeted extension service. However, this effort was stymied by new entrants into the processing industry, who out-paid OCD, the new entrants not having incurred promotional costs. As a result, OCD stopped the promotional effort.

2. Domestic Prices of Oilcrops

At present, the prices being offered for oil crops average less than Ksh. 3.00 per kilo to the farmer. Estimates suggest that a price in the region of Ksh. 4.00 per kilo to the farmer would make oilcrops competitive with other crops. (As a matter of fact, lack of studies on the economics of oil crop production data visa vis other crops is one constraint on its own right). Compounded by the low production per unit of land (low level of technology) the returns to oil crops do not provide a suitable incentive to farmers. More fundamentally, delays in payment by buyers, including co-operatives, has worsened the situation. Cotton production has been one of the most affected crops.

3. Public Support to Producers

Public support to farmers has been weak for all oil crops. Research has been confined to research station (mostly Njoro PBS), so that the oil content of crops being farmed is still low by international standards. This further affects price to producers. Only now are oilcrop extension officers being assigned to districts as a result of the UNDP/IDA supported Oil Crops Development Project. While the NCPB used to have the mandate for the purchase of many oil seeds (sunflower, simsim, castor), NCPB's basic concern was understandably on food grains and pulses. Other inputs such as quality seeds, credit, storage facilities etc have been equally inadequate; as has been market information.

4. Processing Capacity

The installed processing capacity in the country is far in excess of the oilseeds available. There is a lot of idle capacity. This situation has an indirect effect on the prices paid to the farmer and/or by the consumer; as processors try to cover the idle capacity costs from either low prices to the farmer or higher prices to the consumer. While complete data is hard to come by, the following table on three important oilcrops is illustrative:

Table 4:
PROCESSING CAPACITY UTILISATION FOR THREE OIL CROPS 1988

Crop	Installed Capacity (m.t.)	Utilized Capacity (m.t.)	Utilization (%)
Cotton:			
Seed	71,600	12,650	18
Cake	29,911	5,384	
Sunflower:			
Seed	65,620	21,600	33
Cake	24,430	8,062	

Copra seed:		
Seed 20,820	12,820	62
Cake 8,271	5,128	

Nearly all of the above capacity is in major towns (Nairobi, Mombasa, Nakuru, Kitale). This means that when the oilseeds are produced, they have to be transported first to the towns for processing; then the oils/fats and feed cakes are re-transported to the rural areas for consumption. This double transportation has led some people, mostly charitable organizations and church groups, to start rural processing of oilcrops. This has however, brought about its own problems including: lack of sufficient seed, lack of sufficient markets for the oils and cakes, uneconomical oil extraction due to the low efficiency of equipment being used, farmers unaware of cake utilization (some cakes can be harmful to livestock if not handled with care). Most of livestock in ASAL is still Zebu with low yield potential, natural pastures are fairly plentiful in ASAL). In addition, these well-meaning organizations came face to face with constraints discussed under 1 to 3 above. Thus, most of the processing machines have been non-operational.

4. INTERVENTION THROUGH COOPERATIVE MOVEMENT

In summary, the major constraints in the oil crop industry are:

1. Public Policy

Unnecessary Government protection of the urban consumer, and by extension of the dominant oil processor through inappropriate tariff and price policies which allow for importation of cheap crude oils.

2. Production

Inadequate research and extension services, lack of inputs including quality seeds, credit and disease control measure, low gross margins, delayed payment to farmers.

3. Processing

Inappropriate post-harvest and processing technology in rural areas, side by side with overall national capacity, shortage of raw materials.

4. Marketing

Underdeveloped markets for rural processed oils and cakes, lack of market information and well-organized market outlets, lack of basic market infrastructure such as storage and transport, excess capacity installed,

Can the above constraints be addressed through the co-operative system in a district like Kitui?

Kitui is a typical ASAL district. Of the land area totalling 31, 099 sq. km (including some 6,309 sq.km in the Tsavo National Park) 2.2% is classified as high potential (read " high rainfall") area; 36.6% as medium potential; and the rest, 61.2% as low potential. Rainfall regimes are respectively 762 to 1270 mm; 500 to 800 mm and below 500mm per year.

From these dry, unreliable rainfall, high temperature and high evaporation rate conditions, one may deduce that the suitable oilcrops would be castoroil, sunflower, perhaps simsim, and cotton.

In 1990, membership to the co-operative movement in Kitui district was estimated at 13,176 people only, out of an estimated district population of just over 660,000 people. Thus Kitui has only 2 % of the district population and 1% of the national co-operators' population in the co-operative movement. (District Development Plan, 1989/93). Thus, the mobilization of the people through the co-operative movement is currently very minimal. Their activities are concentrated in the Central and, to a lesser extent, in the Mwingi and Kyuso Divisions. Agricultural production is low due to the low rainfall. Therefore agro-marketing societies are not as active as the urban-based savings and credit societies. Of the registered societies, 24 are dormant (op. cit). the full picture is depicted in table 5 below.

Table 5:
COOPERATIVE ACTIVITIES IN KITUI DISTRICT 1988

Activity	Active	Dormant	Total	Share Membership Capital(Ksh.)	
Cereals/grains	6	11	17	425,000	1,086
Coffee	2	-	2	20,000	780
Cotton	-	1	1	3,100	385
Fruits/vegetables	2	-	2	10,000	120
Sisal	-	1	1	2,000	100
Marketing/other crops	2	1	3	51,000	715
Eggs & Poultry	2	-	2	4,000	60
Ranching/Livestock	5	4	9	13,000	2,354
Multipurpose	2	-	2	80,000	750
Consumers	1	1	2	22,000	338
Housing/Savings	1	-	1	n.a.	n.a.
Credit	8	2	10	18,000	5,800
Craftsmen	2	1	3	33,500	285
Miscellaneous	2	1	3	n.a.	n.a.
District Union	1	-	1	20,000	158
<u>Others</u>	<u>1</u>	<u>-</u>	<u>1</u>	<u>24,000</u>	<u>158</u>

Total 32 24 56 695,600 13,076

Problems identified for the high rate of dormancy (Socio-Economic Profiles:Kitui 1990) are:

1. Lack of finances
2. Lack of training/education for co-operators and officers
3. Lack of skilled manpower
4. Lack of infrastructure (stores and transport for produce)
5. Poor prices, especially for cotton
6. The low rainfall, leading to low production of relevant crops

Combining now the national constraints to oilcrop development, the oilcrops suitable for Kitui district and the above profile of the cooperative movement in Kitui, we can make the following conclusions:

1. Production Constraints

Effort towards Co-operative Management Improvement would enable Kitui cooperatives to procure inputs (seed, fertilizers) in bulk for the benefit of members. Given the small quantities per producer, cooperative marketing, if revamped, offers economies of scale in the procurement of storage and transport facilities. This would particularly benefit all oilcrops.

2. Processing constraints

With improved oil extraction equipment (research is now underway in the UNDP/IDA project) farm and trading centre level processing of edible sunflower oil may become viable, targeted to Kitui, Mwingi and Mutomo townships; or to Rural Service centres like Matinyani, Kisasi, Miambani, Ikutha, Mutitu, Migwani and Kyuso. A feasibility study on the use of the oil in local hotels (for cooking chapatis, samosas maandazia etc) in these and the 16 smaller trading centres would be necessary.

3. Marketing

Strengthened co-operatives would have more muscle in dealing with the district monopoly buyers (Kitui ginnery owners and the Bajabar Ltd. among others) of cotton, castor oil and sunflower. It might be possible for a stronger co-operative to by-pass the middlemen altogether and establish their own processing as is the case in other districts. Where the cooperative movement has become a major actor in the market, farm gate prices have improved.

Other permutations are possible. However the national public policy on oilcrops delayed payments to farmers and the low prices are the most

important constraints which no district level cooperatives can tackle adequately.

4. Farm Level Utilization

This is feasible particularly where intensive systems of livestock production are possible. The use of oilseed cakes to improve animal nutrition would in turn increase milk yield in the dairy industry. Possibilities may also exist for increased poultry production. These are possibilities which need to be investigated at district level.

BACKGROUND OF COTTON INDUSTRY

MUNIR ZEVEERY KITUI GINNERY

RECENT HISTORY OF COTTON PRODUCTION IN KENYA

Cotton production was originally introduced into Kenya during the colonial period. It was exclusively destined for export, since there was no yarn spinning industry in the country. It was also apparently regarded as of minor importance compared with other cash crops like coffee, tea and sisal. Production was only encouraged in those areas where, mainly on account of low rainfall, these cash crops were not suitable.

In recent times, particularly since the collapse of the East African Community in 1977, it became necessary for Kenya to pay for imported lint in hard currency. Greater efforts have been made to boost domestic production in the interests of providing local raw material for the expanding textile industry, which has developed largely since independence. This resulted in a steady increase in output in the 10 years up to 1978/79 from 23,000 to 62,000 bales of lint. However, despite the peak of production of 70,000 bales in 1984/85, the long-term trend has been clearly downward. Annual production fell to around 30,000 bales in the three years to 1989/90. This has occurred despite the considerable expansion of irrigated production on the Bura and Hola irrigation schemes on the Tana River since the early 1980's. Irrigated production increased from about 2,000 to 10,000 bales and thus accounted for some 35% of national output by 1989/90. Current output of lint is only equal to around 25% of potential demand of 120,000 bales from the domestic textile industry based on existing spinning capacity.

As in most other African countries, production has always been based exclusively on peasant smallholdings. This is primarily because of the unavoidably high degree of labour intensity involved, rendering it unsuitable for large-scale production based on a permanent hired labour force. This means that the ability to assure a given level of raw material supply to the sub-sector has depended crucially on convincing farmers that the returns from cotton are likely to prove sufficiently attractive relative to those from other cash crops - or indeed from food crops, which will invariably receive priority up to the level needed to assure subsistence - and even beyond this may be seen as potentially competitive sources of cash income.

There is little doubt that the decline in Kenya's cotton production in recent years reflects the increasing belief on the part of many farmers - particularly in traditional cotton growing areas such as Nyanza and Western Provinces - that cotton is less profitable than many of the alternatives.

The growth of this perception may be ascribed to a number of factors, of which the steady decline in the international price of cotton in real terms since the mid-1970's is perhaps the most important. Yet even though price may have been the dominant consideration, it is also true that non-price factors which might otherwise have helped to offset this consideration have not in fact done so. Among these is the primary marketing system, which has failed to assure the basic prerequisite of prompt payment to growers - a negative factor which is far less of a problem in respect of most competing crops, for which, unlike cotton, there is generally more than one market outlet. Thus the chronic inability of either the Cotton Board or of Cooperative Societies or Unions - to the extent that the latter have been involved in financing crop purchase - to mobilise adequate funds for the purpose within a reasonable time has undoubtedly been a major additional factor discouraging farmers from planting more cotton.

GOVERNMENT POLICY TOWARDS THE SUB-SECTOR

At least since the 1930's, the cotton sub-sector has always been subject to a high degree of regulation - as provided for under successive pieces of legislation. Of these the most important has been the Cotton and Lint Seed Marketing Act of 1955 (modified in 1967), which remains the essential basis for the current system of official intervention in the sub-sector. Notwithstanding the enactment of a new Cotton Act in 1988, the 1955 Act gave power to the Cotton Lint and Seed Marketing Board (CLSMB) to regulate virtually every aspect of processing and marketing from the point at which seed cotton was purchased from farmers. Such a regime, which was closely modelled on that in force in Uganda (where production was then on a much larger scale than in Kenya), was clearly based on an official perception that cotton was a crop whose sustained production could only be assured if reasonable guarantees of adequate farm gate prices were offered to growers and of adequate raw material supply to primary processors.

As indicated above, government policy since independence - and more so especially since 1977 - has been guided by the broad principle of maximising national self-sufficiency in cotton. This has been reflected in a propensity to encourage the CLSMB to use its powers under the Act to intervene more directly in both processing and marketing. Thus the Board has acquired or established six ginneries since the early 1970's (one of them nominally under joint ownership with a cooperative union but effectively under total control of the Board), whereas previously all ginneries were privately or cooperatively owned. In addition, since 1978 the Board has assumed exclusive financial responsibility for buying seed cotton as well as selling it - so that all intermediate marketing and processing activities are carried out either by the Board itself or by cooperatives or private organisations operating as its agents - while at the same time abandoning the previous open auction

system of price determination in favour of one based on administered prices. According to the report of the inter-ministerial study team "Policies for the Development of the Cotton Sub-sector" of March 1987, this change was prompted by a combination of factors: Among them were: a. the loss of preferential access to supplies of lint from Uganda and Tanzania and b. a decline in international prices for lint which appeared likely to compromise the ability of the sub-sector to remain self-financing (i.e. in the absence of any government decision to subsidise it).

Subsequently a number of donor-funded initiatives have helped to support the government strategy of trying to boost production. These have included a USAID small farmer support scheme, the Farm Input Supply Scheme (FISS) financed by World Bank, and Integrated Development Programmes (mainly EC - funded) in Nyanza Province and Machakos District.

These initiatives, appear to have had a significant impact in boosting or sustaining cotton production in those areas where it was an established cash crop. This was achieved mainly via the mechanism of supplying inputs - for other crops as well as cotton - on the basis of subsidised credit. The incentive for farmers to grow cotton was enhanced in these areas by making cotton the "anchor crop" under these credit schemes - i.e. providing for individual credits to be repaid through deductions from deliveries of seed cotton to cooperative societies or unions. Thus in order to obtain any inputs under the scheme or at least continue obtaining them each year, farmers had to plant at least enough cotton to cover repayment costs. Apart from credit some of these schemes also provided direct financial support for the establishment of cooperative societies to handle cotton.

The most important single initiative affecting the sub-sector in recent years, however, has been the Cotton Processing and Marketing Project (CPMP). It started in 1982 and was financed by the World Bank. This project, for which Ksh. 275.6 m (US\$ 33.4 m) was originally allocated, intended to improve marketing infrastructure (storage capacity and buying centre), to rehabilitate ginneries and to expand and upgrade the staff of the CLSMB.

It has proved impossible to implement many of the project's components, largely because the original assumptions, both as to the likely level of cotton production, projected to reach 116,000 bales by 1989/90, and the creditworthiness of the CLSMB and the target cooperatives turned out to be excessively optimistic. Indeed because of the chronic financial problems of the Board, and its consequent inability to raise sufficient finances for the purchase of the seed cotton crop, it diverted some project funds for this purpose notably following the bumper crop of 1984/85.

It is clearly impossible to quantify the impact of these various schemes on the level of cotton production with any precision. However, it seems

reasonable to infer that the progressive exhaustion of funding from these sources since the mid-1980's has been a factor contributing to the slump in output to around 30,000 bales in each year since 1985/86, the lowest levels attained since the mid-1970's apart from the drought year of 1983/84.

THE FUTURE OF THE COTTON INDUSTRY.

At present, the marketing is dominated solely by the Cotton Board of Kenya, which has up to now complete monopoly rights in marketing the ginned lint and seeds for millers.

To collect and process the seed cotton from the farmers, the board appoints buying, transporting and ginning agents in various designated zones. Traditionally the zones are various districts, for example in Machakos District the Machakos Cooperative Union is the buying and transporting agent, while the ginning agent is the Board's own ginnery in Makueni.

The Board in conjunction with the Ministry of Agriculture sets the price for seed cotton, which has recently been raised from gross Ksh. 6.00 a kilo for AR and 3.00 a kilo for BR to respectively 10.00 for AR and 5.00 for BR. The rates for paying the buying, transporting and ginning agents are set by the Board. These costs plus the cost of running the board are reflected in the price of lint which is again a fixed price set by the Board.

At present the domestic price of lint is set at 45/60 a kilo which, given the superior quality of Kenyan cotton vis a vis average world cotton production, due to the fact that Kenyan cotton is handpicked, reflects the present world market price for cotton. Last year record world demand for cotton coupled with low stock levels ensured a steady high price throughout the year, whereby most commodity markets suffered stiff declines.

As regards domestic demand one can conclude that the recent price increase of seed cotton was aimed at breaching the shortfall in domestic supply. At present only 25% of Kenya's demand is fulfilled, with some 80,00 bales (each bale equals 185 lint) being imported to satisfy domestic demand. In effect this means that the country spends some 28 million US dollars to import cotton, and hence if cotton can be produced locally, this would mean scarce foreign exchange can be utilized elsewhere to help develop the country.

However, the point is how to achieve this. There are some people of the opinion that the free market should be implemented into the cotton industry, with the decontrol of the lint and seed prices. In effect this would mean that every participant in the cotton industry would be totally influenced by the world market price for cotton lint and seeds, assuming that the various textile millers and oil millers do not collude.

This sounds quite feasible on paper. The price of seed cotton would be determined by the world market, and the private or co-operative or board ginners would be given licences to buy and sell the processed lint and seeds wherever they chose within the country. The farmers could possibly be paid an interim payment with a bonus paid if the lint/seed price achieved was favourable. Alternatively, the ginner could forward sell his production, and with a firm letter of credit in hand know firmly what price to pay farmers. This latter suggestion would ensure the prompt payment of farmers, agents, and ginners, thus removing a huge bottleneck in the industry and freeing government coffers from Board losses.

All this sounds easy, but it must be remembered that we are not dealing with an industrial product which when fully developed would benefit from competition, but an agricultural product. In a perfect free market as proposed, the world price will determine whether a farmer grows cotton or not. At present, the world market price corresponds to the domestic price, and if this situation continues or the price increases further, the farmer is guaranteed the present Ksh. 10.00 a kilo gross, or more. In such cases given that the free market removes the fundamental bottleneck of payments, the cotton industry should move from strength to strength.

There is a problem. The world market price fluctuates down as well as up, and given the recessionary environment the world seems to be finding itself in, the outlook for commodities looks unfavourable. If for example, not unplausibly, the world market price of cotton in the coming season falls some 50%, the domestic prices for seed cotton will fall to Ksh. 5.00 for AR. The large number of farmers encouraged to grow the crop on the basis of the price of Ksh. 10.00 would, given the halving of the price, reject cotton growing for the next season.

This cobweb model of domestic supply movements guided by world price movements could issue a kiss of death to the industry. Although simple and mechanical, the model has proved useful in explaining why the prices and outputs of some commodities have shown pronounced cyclical movement on the world stage.

An agricultural commodity like cotton essentially needs a fixed price, especially when a country is trying to save foreign exchange. Cotton is uprooted after the plant reaches fruition and thus the farmer has the choice every year as to whether to plant cotton again or grow an alternative. The farmer has to be extremely price sensitive, as is obvious when considering the dramatic rise in production likely to be experienced in the coming season, given the new seed cotton price. Does this mean that as a country we should keep the present structure with the Cotton Board holding on to its monopoly and the industry subsidizing the Board's losses? The answer is sadly, yes. We do not live in an utopian world with absolute free trade

existing - even within East Africa. Ideally, the East African countries could rid themselves of most barriers to trade and adopt a currency similar to the European E.C.U which would hopefully replace the dollar as the currency of trade, even in cotton. This could result in Tanzania and Uganda growing the cotton, and Kenya importing it from them and exporting the finished textiles. As cotton farming and ginning were phased out, alternative crops would have to be encouraged, if only to aid the stemming of rural-urban migration.

Since this scenario does not exist however, the Board's monopoly rights and the fixed pricing system should remain, but the present structure of the Board should be radically altered. Staffing levels should be cut with the closure of all the Board's district and regional offices; and the role of the Board in distributing of loan chemicals should be taken up by the respective buyers of the crop. In addition, the Board's mismanaged ginneries should be privatised.

These reforms should substantially reduce the losses, but maintain the benefits of the existing system. Further to the above reforms, a substantial revolving fund should be set up to help the Board to finance the crop and pay promptly the various bodies involved in the industries, primarily the farmers. To ensure that the fund is revolving, demand for domestically produced cotton should be maintained by tight control on import, and vitally, payments for lint and seed to the Board should be made by the respective millers in the form of bankers cheques. If these reforms are undertaken, Kenya would easily be able to meet its domestic demand. The gain from the reduced imports would justify the ensuing limited, or possibly no subsidy given to the Board. Also, it must be noted that exports of manufactured goods get an export rebate of 20% because they help secure foreign exchange. Given this, it is inconceivable that a large subsidy would be required by the Board.

In addition to the latter, it should not be forgotten that a substantial number of people benefit from the cotton industry. Farmers benefit from the new price and this is clearly demonstrated by their zeal in growing cotton this season. Ginneries provide employment to several thousand people, and being primarily based in the rural areas, this helps stem the rural - urban migration. Cotton also plays a multiplier effect in the incomes of rural areas, e.g. supporting small town shop-keepers and other small businesses. However, not everyone is happy with these conclusions, not least of all the textile millers. They would have to pay more for the lint and hence their consumers will in turn pay more. It seems obvious though, that if the country benefits, then the latter is a small price to pay. It must be noted though that the world price does reflect the price of domestic cotton and hence at present no such costs are incurred by the consumers.

Moreover though, the textile millers would and do already export, and if the

price of domestic cotton is too high vis a vis the world market price, then the prospects of developing a successful export oriented industry would be substantially hampered to the severe detriment of this country. This is a valid point but the government has already allowed anybody to import any raw materials and any product duty free and manufacture under bond, or in the designated export processing zones for products which would be wholly exported. This in effect covers any criticism. Lets hope that the government is not bullied into accepting the free market as the panacea, which in reality would be a disaster, for the long term future f the cotton industry. Precious hard earned foreign exchange should not be squandered on importing cotton and vegetable oil, when with planning and effort both can be produced locally creating the jobs and incomes much needed.

WATER DEVELOPMENT POTENTIAL OF KITUI DISTRICT

**PIETER G. VAN DONGEN
GWS**

1. INTRODUCTION

1.1 General

This paper discusses the availability of water resources in Kitui District and the possible options for development.

1.2 Background Information

Kitui District is situated to a large extent within the arid and semi-arid climatic zones of Kenya (Fig. 1), being semi-arid in the western highlands and arid in the eastern and southern plains. Average annual rainfall ranges from 500 mm in the driest eastern plains to 1,100 mm in the higher areas surrounding Kitui township (Fig. 2). The rainfall occurs normally during the months March to May and during the period October to December. The latter rainy season, the "short" rains are the most reliable. The variation in rainfall is, however, dramatic, with variations from year to year from 20% to 300% of the yearly average.

The average annual potential evaporation is 1,800 mm while the average temperature amounts to 24° C. The elevation of Kitui District ranges from 400 - 600 m. in the eastern plains to the highland area at 1,000 - 1,500 m. above sea level. The present population is estimated to amount to 800,000. The total surface area of Kitui is 31,000 km²; excluding the Tsavo East National Park the size amounts to approximately 25,000 km².

Virtually the whole of the District is underlain by Precambrian Basement rocks, all metamorphic and heavily crystalline rocks. Only along the southwestern border of the District, the Yatta Plateau, is there Tertiary volcanic rock. It forms the main watershed in Kitui between the Tana and Athi River drainage areas.

2. HYDROLOGIC CYCLE

When analyzing the availability of water resources, a short discussion on the hydrologic cycle is required. Its main elements, as depicted in Fig. 3 are Evaporation (from open water, soil and vegetation), Precipitation (or rainfall), resulting in Surface Runoff (through gullies, streams and rivers) and Infiltration. The latter causes an increase in soil moisture, which is mainly used by vegetation and thus evaporates again, while part of the infiltrated

water percolates down to the groundwater store, and creates a groundwater flow. The elements of the hydrologic cycle which we are interested in for the purpose of water development in Kitui District are 1. rain water, 2. surface water, and 3. groundwater.

3. RAIN WATER

In Fig. 2 is depicted the average annual rainfall distribution for Kitui District as calculated from a 20-year period of 1962 - 1981.

When trying to estimate roughly the total amount of rainfall which Kitui (excluding Tsavo East) receives in an average year, we come to the following figures:

- 50% of Kitui receives 400 mm/yr,
or $12,500 \text{ km}^2 \times 400 \text{ mm} = 5,000 \text{ million m}^3$
 - 30% of Kitui receives 600 mm/yr.
or $7,500 \text{ km}^2 \times 600 \text{ mm} = 4,500$
 - 20% of Kitui receives 800 mm/yr,
or $5,000 \text{ km}^2 \times 800 \text{ mm} = \frac{4,000}{\text{million m}^3}$
- Total 13,500 million m³

This is a very large amount of water, of which, of course, a very high percentage evaporates. Nevertheless, if only 1% of this water could be captured and utilised, it would mean that every person in Kitui would have not less than 500 litres of water per day available!

Of this 13,500 million m³ of rain water, 80% or 10,800 M m³ evaporates, including evapotranspiration through vegetation, 15% or 2,025 M m³ runs off through streams towards the main rivers, while about 5 % or 675 M m³ of the water infiltrates and percolates downwards into the groundwater store.

4. SURFACE WATER

Two major rivers carry a permanent flow of water along the borders of Kitui. The largest river of Kenya, the Tana River flows along the northern border of the District. Its average flow along that part of the river is 100 m³ per second, or 8.6 million m³ per day, or 3,140 M m³ per year. The Athi River flows along the southwestern border of Kitui and has an average flow of 25 m³ per second, which is one quarter of the Tana River flow.

In addition to these permanent flows, two major seasonal rivers are found. These are the Tiva River, draining the central part of the District and flowing towards the southeast; the Thua River is the largest, flowing eastward and draining the central highlands. In addition, numerous smaller seasonal streams drain towards the east.

Combined, the main seasonal rivers and smaller ephemeral streams carry an amount of about 2,000 million m³ per year.

5. GROUNDWATER

The major groundwater occurrences can be divided into three categories:

- a. Groundwater in the sandy alluvium of seasonal streams and rivers;
- b. Groundwater flowing out as springs from storage in colluvium on hill sides;
- c. Deep groundwater in weathered and fractured hard rock.

Shallow Ground water in Alluvium

A rough estimate leads to a total length of sandy river channels of say 2,500 km, with an average width of 10 metres and a saturated thickness of 1 metre. The total sand volume is thus 25 million m³. At an effective porosity of 10% this contains an amount of 2.5 million m³ of groundwater. This groundwater store is normally recharged twice a year during the wet season and there is little risk of permanent depletion. Temporary depletion during the dry season because of subsurface groundwater flow can be countered by construction of subsurface or sand dams.

Even if this water is tapped by say 500 wells, each yielding 5 m³ per day, the total abstraction is only a small percentage of the total amount available.

Springs

Although the number of permanent springs in Kitui is unknown, it is probably relatively small and estimated to be not more than about 50. Assuming an average yield for these springs of only 0.5 litre per second, the total amount of water yielded by the springs is 2,160 m³ per day. In addition there are numerous seasonal springs and seeps, which can be improved and protected and be used for part of the year.

Deep Groundwater

Groundwater occurs at greater depth in weathered zones of the hard rock and in deep fractures and fissures of the same (Fig. 4). This type of aquifer is being increasingly tapped all over Kenya by deep boreholes. Normally these deep boreholes in hard rock do not yield a large amount of water (average 2 to 5 m³ per hour), although in a few cases, when situated in major fault zones the yield can be as high as 25 m³ per hour. In Kitui only a few boreholes have been drilled in the past as there still exists a persistent belief that "there is no groundwater in Kitui". When analyzing the available data of the few boreholes drilled, it can be seen that, indeed in the lower parts of

Kitui, boreholes have not been very successful, as these were dry or struck rather salty water. There are sound hydrogeological reasons why this is the case, but the explanation would lead to a rather technical discussion which is beyond the scope of this paper. However, along the foothills and in the more hilly areas of Kitui there is plenty of scope for development of deep groundwater resources.

It is estimated that tapping of deep groundwater is possible in about 20% of Kitui District, or in an area of 5,000 km². If in this area one borehole is drilled every 10 km², a total of 500 could be drilled. Assuming a relative low average yield of 10 m³ per day per borehole, a total amount of 5,000 m³ per day could be produced. There would be no danger of depletion as this amount is approximately 1% of the recharge. The estimated storage of deep groundwater is in the order of 1,000 million m³.

Drilling of such a large number of boreholes is not at all unrealistic as shown by a water well programme carried out recently in the adjoining (ASAL) area of Gachoka Division in Embu District where geological and climatic conditions are quite comparable, and where not less than 150 successful boreholes have been drilled in hard rock in an area of 1,350 km².

6. WATER AVAILABILITY

The figures given above on the available water in the District illustrate the vast amount of water received from rainfall plus a large amount flowing through the main rivers and streams. This would actually be more than sufficient to provide all people and livestock with water.

Nevertheless, there is no doubt that Kitui is a very dry area with an acute water shortage. Why is there a water problem?

The figures given above on total amounts of rain, surface and groundwater are in a way misleading because of the following factors:

- strong variation in total amount of rainfall from year to year;
- uneven rainfall distribution over the District;
- no permanent rivers except on the extreme borders;
- no significant sedimentary groundwater aquifers;
- except for Kitui town, virtually no operating piped water supply for the smaller townships and villages.

7. WATER DEMAND

The present (1991) population of Kitui District is estimated to amount to 800,000 people. Population densities vary strongly, the density in the high lands being five times the density in the lowlands.

Of the total population, it is estimated that at least 600,00 do not have a clean and safe water supply. At a consumption rate of 20 litres per day per person, a total amount of 12,000 m³ per day would be required in the rural areas of Kitui. In addition livestock water requirements should be estimated and included in the total water demand.

8. DEVELOPMENT OPTIONS

As discussed above, water resources are plentiful, but unevenly distributed. Nevertheless, it is the aim of this paper to demonstrate that water resources are available and that it is more a matter of development of appropriate resources, and construction of storage and distribution facilities, than a matter of availability. Since rainfall is rather unreliable, more emphasis should be given to ground water development, and less to rain water harvesting systems such as rock and roof catchments.

When looking at the map of Kitui, the following options are feasible:

- a. Highland areas (Central and parts of Mwingi and Mutito Division), do have several good options for water supply, being deep boreholes (50 to 70 m depth), shallow wells in or close to streams, possibly in combination with subsurface dams or sand dams; small earth dams; roof catchments at public institutions (schools).
- b. Lower hilly areas (Mwingi, Kyuso, Mutito and Mutomo Divisions) have good potential for shallow wells in river beds (in combination with sand dams), limited potential for deep boreholes; small earth dams for livestock; rock catchments and roof catchments only where the other options are not feasible.
- c. Eastern Plains (parts of Mutito, Kyuso and Mutomo Divisions) have rather limited options, being shallow wells in the main river channels, small earth dams and roof catchments.

9. CONCLUSIONS

The available water resources in Kitui District are sufficient to provide its people and livestock with drinking water. Very little scope is available for development of irrigated agriculture.

Development of the groundwater resources should concentrate first on construction of shallow wells with handpumps, as these provide safe, clean and permanent water. Other types of water supply structures are less desirable as they are either unreliable (rock catchments), contaminated (earth dams) or very costly (roof catchments).

10. RECOMMENDATIONS

Detailed assessment of the available surface and groundwater resources is needed for the whole district. In addition, a thorough spring inventory should be carried out.

Emphasis should be given to shallow well construction, if necessary in combination with sand dams or subsurface dams.

Figure 1

Figure 2

Figure 3

Figure 4

EVALUATION OF WATER POINTS CONSTRUCTED BY MUTOMO SOIL AND
WATER CONSERVATION PROJECT

**MOSHE FINKEL
FINKEL AND FINKEL**

1. BACKGROUND

The Mutomo Soil and Water Conservation Project commenced a five year programme in 1982. In its water development activities the programme aimed at improving water availability and reliability for domestic use through the application of small scale, appropriate community based technologies. The water points were intended to be taken over, managed and maintained by the communities they served. The selection of technologies was, therefore, limited to small scale, simple, water harvesting techniques. Construction of the water projects was to include major inputs from the communities in the form of labour. Projects were to be initiated only after water user groups were formed. Local fundis were to be trained to enable sustainable construction and future maintenance.

Between 1982 and 1990, the Mutomo Soil and Water Conservation Project assisted in the construction of some 623 water projects. Initially, the programme saw a slow start, especially in construction. During this period emphasis was put on the selection of technologies; development of technologies; development of construction standards and details; and on the mobilisation of the local communities. This slow start built up into a flurry of activity in the last three years in which 392 water facilities were constructed. The main techniques practised included roof catchments with various designs for storage tanks and rock catchments with storage tanks. The design of these storage tanks, evolved during the first few years of the project until standards were adopted. The design standards and construction materials and practises for tanks collecting water from roof catchments also underwent continuous changes and experimentation.

Since 1987, 169 more points were completed. This included almost exclusively ground water tanks collecting water from roof catchments (147). This gives the impression that the project, now under the Kitui Integrated Development Programme (KIDP), is scaling down its activities and limiting its scope to a single water technique.

This report summarises a 20 week study undertaken from December 1990 to evaluate the technical success and the social/cultural impact of establishing these water points. The evaluation was commissioned by the Kitui Integrated Development Programme (KIDP) and funded by DANIDA. It was conducted by a team lead by the author and included William Sakataka on water related rural sociology issues and Vincent Gainey on the evaluation of the techniques. KIDP assigned key members of its Mutomo staff to join the

evaluation team full time. These were Mrs. Jacinta Gathuo, the project sociologist and Mr. Ngunu of the Project Construction Unit. Mr. Justus Waboyo assisted in the coordination of the field activities. The team visited 550 water points to complete their technical evaluation and at each point conducted interviews with water users to evaluate the social impact. The interviews also included questions regarding water demand.

2. SUMMARY DATA

The total water production potential for these 550 water points is 580,000 cu.m./yr. This is well above the present water demand for domestic purposes which is estimated at 385,000 cu.m./yr. The actual water supplied through the programme constructed water points is estimated at only 245,000 cu.m./yr. which represents only 42% of the potential. The remaining water (140,000 cu.m./yr.) is obtained through traditional means such as scooping from the riverbeds or directly from the rivers.

This overview of water supplied is skewed when analyzing the water supplied per location and per sublocation. It has been found that some areas are still extremely water scarce and that others are highly dependant on single water sources that may not be adequate technically. Voo and Ikanga locations represent the weakest link in construction of water points. Voo location, with a population of 13,000 has an estimated present demand of 50,000 cu.m./yr. The programme has constructed water points with a supply potential of 30,000 cu.m./yr but actually delivering only an estimated 17,000 cu.m./yr. Two thirds of the present demand is now met by traditional means with the programme constructed points supplying only one third of the demand.

Ikanga location, with a present population of 19,250 had an estimated present demand of 74,000 cu.m./yr. The programme has constructed water points with a supply potential of 33,000 cu.m./yr but actually delivering only an estimated 23,000 cu.m./yr. This represents a higher than average delivery rate of 65% which may be explained by the higher level of maintenance due to the scarcity of water in the region but an overall low level of supply.

This low level of supply represents the various weaknesses in the programme. These include technical and community participation weaknesses. The technical weaknesses are associated with technique selection, site selection, design standards and technical details. The social weaknesses are associated with the timely involvement of the communities with the water points are meant to serve, the level of involvement at all stages of inception, planning and construction, the level of involvement in operation and management of the completed water points, the low level of training and the communities perception of ownership. There are also no clear guidelines as to ownership or clear division of responsibilities between the communities, the project and GoK line ministries.

The projected domestic water demand for the year 2000 is 770,000 cu.m./yr. This is well above the present supply potential although the water points constructed by the Project are triple the estimated actual present water supply. When analysis is conducted on a sublocational basis, the balance of water to be developed is much higher than the overall balance. This indicates the need to continue construction of water points as well as the need to fully develop the existing points to their full potential.

The techniques developed and constructed by the programme include: roof catchments, ground catchments, shallow wells, subsurface dams, earthfill dams and spring protection. An economic analysis conducted by the evaluation team showed large differences in the cost of water per technique. The ranking of techniques according to cost of water, giving the lowest cost the highest ranking is as follows:

- spring protection
- shallow wells
- large rock catchments
- sand/subsurface dams
- medium and small rock catchments
- roof catchments

Earthfill dams could not be considered in the economic analysis due to their short economic life as a result of the heavy siltation and evaporation rates and their low actual level of performance.

The real cost of water ranges from less than 5 Ksh/cu.m. delivered through spring protection to 90 Ksh/cu.m. delivered through roof catchments. The techniques were ranked according to their importance in the actual supply of water as follows:

TECHNIQUE	%OF WATER ACTUALLY SUPPLIED
-rock catchments	33%
-earthfill dams	27%
-shallow wells	18%
-subsurface/sand dams	9%
-spring protection	7%

-roof catchments	6%
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By comparing the two lists of techniques, it was found:

1. Roof catchments are the most expensive technique per unit of water supplied as well as the least important technique in terms of the total water supplied. Yet in the last three years roof catchments have become the main activity of the programme.
2. Shallow wells produce the lowest costing water per unit supplied but the overall shallow well programme is technically weak and supplies only 18% of the water delivered.

The analysis of the design standards and criteria and construction details showed weaknesses mainly in the shallow well and the subsurface/ sand dam programmes. The weaknesses were conceptual and involve inadequate site selection and design criteria. Shallow wells are the most economic technique and in some areas shallow ground water is the only viable option for development. Further work is, therefore, required to assure the best possible site selection and the development of effective structures.

The rock catchment programme is impressive. Following an initial period of developing design criteria, standards and details, the programme has now mastered this technology which has become its mainstay. Some improvements in the relative sizing of the catchment area and storage volume may improve the effectiveness of this technique and some improvements to the water management could improve the economics.

Roof catchments are the most expensive technique for water development since they require relatively small storage tanks. They supply only 6% of the water actually delivered in the Division. Analysis of the construction standards shows imbalance in the relative sizing of the storage capacity to the roof area resulting in additional expenses. Some construction details were identified as requiring improvement.

RECOMMENDATIONS

PROJECT FRAMEWORK

1. Clear division of responsibilities between KIDP, MoWD, MoA and the local communities regarding the design and installation of improved water points should be made. While the Project could continue to assist with expertise in project design, technique selection and development, and establishment of water management programmes, the contact between the communities and the line ministries should be strengthened. Construction supervision and

maintenance should be by line ministries.

2. There is need to establishment of clear guidelines as to the division of responsibilities for the operation, management and maintenance of existing and new water points. Line ministries should have the responsibility for the technical maintenance of the water points but the communities should retain responsibility for management, operation and minor maintenance.

3. There is need to establish grass-root water user committees with clear roles and responsibilities and with the power to enforce regulations and to operate a budget.

4. Training of line ministries' staff in all aspects of ASAL water technology including technique selection, site selection, construction details, water management and maintenance, and operation is needed so as to eventually facilitate handing over of project responsibilities to the line ministries.

5. Training of community representatives in water management, operation and maintenance of ASAL water technologies is essential.

PROJECT SELECTION

1. Projects should be initiated only where there is a proven need for improved water supply in terms of quantity, quality or distance.

2. Projects should be initiated only where a community has identified a need for water, the programme has confirmed this need and the community has taken steps to participate in the provision of water supply.

3. The selection of technique together with the community, community participation in site selection and in determining the levels of contribution to construction activities as well as commitment beyond construction in the management of the water point should be planned.

4. Construction should be only after community is fully aware of the division of responsibilities for operation, maintenance and management of the proposed water project.

5. The installation of the water point should include training of community members in operation, management and maintenance. This includes establishing management programmes for the total water resources of the community - when and how much water to draw from each source.

TECHNIQUE SELECTION

1. Preference should be given to development of shallow ground water

through shallow wells, subsurface dams and sand dams. Improvements should be made in technical capabilities in site selection, design standards and construction details.

2. New rock catchments should only be constructed where shallow ground water is not available or where there is a requirement to diversify water sources. Capacity should be limited to 1000 cu.m./yr. or more produced.

3. There is need to diversify water sources on a sublocational basis by providing a mix of water sources - direct rainfall harvesting (rock and roof catchments), runoff harvesting (ground catchments and dams), and shallow ground water (shallow wells, subsurface dams and spring development).

4. The lowest priority should be given to roof catchment construction. Such construction should be only for special purposes as institutions - schools, clinics and the like.

DESIGN CRITERIA

Design Rainfall

Mutomo, Kanziko - 250mm
Voo, Ikanga - 200mm

Catchment/Storage Ratio

Roof Catchments - 4.5-5.5
Rock Catchments - 6-10
Ground Catchments- 13-50

Per Capita Water Demand

1991 - 10.5 litres/day
2000 - 15 litres/day

CONSTRUCTION DETAILS

Roof catchments with 78 cu.m. tanks

- design according to catchment /storage design standard
- improve roof details including better support, higher slope and silt trap
- remove faulty handpumps. Handpumps not recommended for small storage capacities.
- maintain ferrocement structures. Crack rehabilitation.

Roof catchments with 46 cu.m. tanks

- design according to catchment/storage design standard
- improve outlet chamber to enable drainage and access

Rock Catchments

- design according to catchment/storage design standard
- preference for gravity rockfill structures

Subsurface/Sand Dams

- develop adequate design criteria, criteria for site selection and construction details

Shallow wells

- improve site selection criteria
- develop improved design criteria, construction details and management programmes.

THE VEGETATION STATUS

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INTRODUCTION

The diversity of climate and landform in East Africa, of which Kitui is a part of, leads naturally to diversity in vegetation. The spectrum extends from sparse semi-desert vegetation to dense rain forest, and includes various bushland and grassland types, as well as mangroves and other swamps and the afro-alpine vegetation which surrounds the permanent snow and glaciers of the highest mountains. Vegetation can be a timber resource, a tsetse or disease habitat, an indicator of climate condition, an impediment to cultivation, a unit of certain grazing potential, a habitat for wild animals or a scenic attraction. In the context of range development, vegetation is likely to hold several values concurrently; even its scenic attraction cannot be ignored if tourism is a factor in development.

The range area embraces almost all vegetation types, from semi-desert to afro-alpine moorland. It excludes only dense forest and derived bushland and some categories of swamp vegetation. The most important types are deciduous woodland, open and wooded grassland, evergreen and thorn bushland and dwarf shrub grassland. However precise description of a stand has long depended on the observer in the absence of accurate measurement at the site. This makes historical reconstruction of vegetative changes of a site difficult.

There is no disputing the value of vegetation as an indicator of environmental condition, or the value of relic communities or species in the theoretical reconstruction of vegetation potential, but in future the effort should be made to quantify such relation in terms of environment as well as of vegetation and to use the physical terms in the classification of ecological zones. This is the approach that has been attempted for rangeland classification in East Africa as described by Pratt et al (1966) and recently refined by Grunblatt, Ottichilo and Sinange. (1989). These will certainly go a long way in assessment and statements of statuses of various vegetation communities in this country.

The status of vegetation, at any time is the result of the combined influence of all land attributes such as soils, fauna, climate, water and human beings. The magnitude of that influence may depend on the intensity and time or period taken to influence it. Thus time is also a factor in landscape ecology.

An example is Mutomo Division in Kitui. At one time the area was dense woodland. During the last half century people have destroyed the

woodlands. As a result of the removal of the trees, poor, sandy, permeable soils were exposed by man; then dry microclimates developed and finally biological humus mineralization was prevented. This has resulted in loss of humus, soil capping formation, impermeable soil, topsoil loss and finally formation of sparse vegetation. Where very dense woodlands existed, originally, sands are found now. This displays the interdependence of the parts played by climate, rock, vegetation, fauna, soil, hydrology and man. This is a process thought to be going on in the rest of Kitui District.

THE VEGETATION OF KITUI

Eco-climatic zone V of East Africa is the southern extension of a large belt of arid land which encircles the Ethiopian Highlands. It includes about half of Kenya and extends well into Central Tanzania. In Uganda it is represented only in the drier parts of Karamoja District.

In Eastern Kenya, the **Commiphora** woodlands dominate. This vegetation type is exceptionally well developed for such an arid environment. Probably it can only establish itself under a favourable combination of rainfall and other circumstances and, when a population becomes senile or is reduced by over burning, it is likely to be replaced initially by shrub species or by grassland. It may be, therefore, that the climax vegetation in these areas should be regarded as a cycle of distinct vegetation types, in which a grassland phase is possible. The following is a brief description of the vegetation of Kitui in order of importance:

a. Woodlands:

Woodlands include the **Commiphora** woodland, which occurs on red Basement soils, and small areas of **Acacia** woodlands on deep alluvial soils with tall **Acacia tortilis**, **Acacia etbaica**, **Acacia albida** and **Balanites egyptica**. Other woody species associated with the commiphora woodland are **Boscia spp.**, **Boswellia hilderbrandtii**, **Delonix elata**, **Melia volkensii**, **Lanea spp.**, and **Sterculia africana**. The baobab (**Adansonia digitata**) is important locally, and several species of **Acacia** may occur, especially **Acacia bussei** and **Acacia tortilis**. The ground cover includes several useful grasses, herbs and may be dominated by **Panicum** (or by **Chloris roxburghiana**.) Other grasses are **Cenchrus ciliaris**, **Digitaria spp.** and **Enteropogon mascrotachyus**. **Leptothrium senegalense** and **Aristida spp.** are very common but are of low grazing value. Most common herbs include **Barleria spp.**, **Justacia spp.**, **Blepharis** and **Tephrosia spp.**

b. Shrublands:

Shrublands, are also extensive in Kitui and take many different forms. The most extensive include forms of bushland related to **Commiphora** woodland described as when the **Commiphora** is supplemented by shrub species of **Combretum**, **Cordia**, and **Grewia**. These are also communities of shrub-

Commiphoras often with **Terminalia orbicularis**. The grass cover in all cases is dependent on the density of the woody vegetation, but usually contains many annual species like **Cenchrus ciliaris**, and **Chloris roxburghiana**.

c. Shrubbed Grasslands:

Shrubbed grasslands and wooded grassland occur mostly as intermediates between the typed described and grassland, especially where grassland formerly maintained by fire is now under encroachment by woody species **Themeda-Acacia drepanolobium** wooded grassland is a more stable type which occurs on black clay as edaphic situation.

d. Grasslands:

Grasslands are limited here in extent but varied. Most are associated with soils of impeded drainage and flood plains.

THE STATUS OF VEGETATION IN MUTOMO DIVISION

Land use activities are changing the Kitui vegetation and landscape gradually. Different parts of the district are at different stages of change. The Central hill have changed most with a fairly high percentage of land now under active agriculture. The Eastern lowlands (statelands) are least disturbed due to lack of surface water for man and his livestock. The Southern, Northern and Western areas are at different stages of change but essentially more than half of the land is still fairly little disturbed. The southern conservation area of Tsavo National Park has been undergoing its own ecological changes with a lot of influence from, climate, wildlife and man.

Assessment of the status of vegetation at any site needs some knowledge of long term environmental circles of the area and what climax physiognomic and vegetation communities would be representative of the prevailing conditions. Or if no long term circles are known some climax vegetation communities would be representative of the current conditions of the area. The many factors which cause changes in the vegetation of any landscape, for example climatic, geologic, soils and so on, can be considered to be stable in this region. However in recent years there have been increased landuse activities by man in this area that are slowly altering the vegetation. These activities are mainly livestock raising, agricultural tillage of the and conservation.

Surveys carried out in Mutomo Division indicate that the area has six major cover categories as summarized on Table 1. The area is thought to have the dense **Commiphora** woodland as the climax vegetation. The other cover types are derivatives of the dense woodland. These derivatives are due to levels of livestock use and cultivation. Overgrazing of dense woodlands leads

to open woodlands or open shrublands.

Areas cultivated for a time and left fallow to recover would pass through several stages of succession before reaching the climax dense woodlands. Some of these stages could include open shrubland, dense shrublands, dense wooded shrublands, and dense shrubby woodlands. So vegetation degradation in this region has been caused by cultivation and overgrazing locally. The formations, that is cover types, (Table 1) which intuitively can be considered as far from the climax vegetation are open woodlands, open shrublands and fallow lands. Croplands are completely artificial. All these comprise about 28% of the land. Thus just over 70% of Mutomo Division where this survey was done is close to its natural state.

Table 1
Estimated Major Cover Types: Mutomo Division

Cover Type	Percentage Cover
1. Dense woodlands	51
2. Open woodlands	3
3. Dense shrubland	20
4. Open shrubland	7
5. Fallow land	11
6. Croplands	7
7. Others	<u>1</u>
Total	100

Mutomo Division is hilly and undulating with highly erodible soils if exposed. Most of the open woodlands, shrublands, fallowlands and croplands showed signs of mild to very severe soil erosion, especially in areas with slopes of over 6%. Chances of recovery of these areas to full vegetative cover is very low and slow. In this respect excessive and careless opening up of the natural vegetation, above the present level, will lead to the loss of top soil in large areas. Then soil moisture content will be reduced leading to much reduced productivity. Severe food and water shortage will be the final result. This scenario is made worse by the ever increasing human population in the area. This population will need more land opened for food production.

Therefore, looking at the ecology of the area in historical perspective, there is cause for getting concerned about the future of the ecosystems and therefore a need for planning development of the division. Long before the local people settled here there was little or no influence on the landscape until the pastoralist/ hunters arrived on the scene. Then the population was sparse and negative effects on the vegetation were negligible. It is thought that the greatest influence on the vegetation from man was the frequent fires caused by the honey gatherers. The advent of subsistence cultivation and veterinary services, leading to more livestock surviving, increased

pressure on the land. However, since there was ample land, shifting cultivation was practised and exhausted area left to recover. This practise is still evident in a few areas in the south. However most people are now settled permanently in one place and there is little room or suitable empty areas to move to. Thus the land will soon be very exhausted, eroded and rendered unproductive if appropriate land use practises are not instituted.

SITE SPECIFIC STUDIES: STATUS OF VEGETATION AND LAND USE SUMMARIES

Stereo sets of aerial photographs taken in 1980 at a scale of 1:10,000 were used in conjunction with recent field checks to produce information on vegetation and land use in Mutomo Division. The main objective of this survey was to appraise the current status of vegetation in areas occupied by different water groups in Mutomo Division.

If development activities have to be effected in the areas next to water sources in various water catchments, effective measure are needed to have such catchments developed in a manner that is environmentally sound. In so doing, urgent and accurate information on the current land use and vegetation types is required. The status of erosion needs to be understood perfectly. The range carrying capacity should be equally known. Finally, it is essential to establish the total population within the water catchment so that their demands on the land can be determined and appropriate development plans instituted.

Various sites in Mutomo Division were covered to assist in achieving this major objective of planning sustainable development of the water catchments. Such sites included: Isamallu, Mwangala, Kyangulumwa, Ngosini, Mavulia, Utekilawa, Kamwove, Kwangalia, Kwambaki, Kyanika, Kamukui, Ukenge, Yambu, Kaseva, Lingithya, Imau, Yemangulu, Nzonzweni, and Kilamba. (DANIDA, 1991). For the various sites surveyed, the range and vegetation conditions, as well as trends, were studied. The land use conditions on these sites were also determined. Land units on these sites were interpreted from the aerial photographs. These land units were therefore described in terms of vegetation types, range carrying capacity, landuse types (present and recommended), erodability, soil erosion condition and so on.

Each land unit is determined by various criteria among which slope is the major one. Any site could be divided into mainly four major zones. These are 1. Minor hills 2. Footslopes 3. Dissected erosional plains 4. Valleys. The slope categories used were 1. above 20% 2. 12-20%, 3. 8-12% 4. 6-8% 5. 2-6% 6. 2-4% and 7. 0-2%.

These major zones also have sub-classes being differentiated mainly by the slope categories.

In areas where tree species and herb cover have been degraded, certain species were recommended for rehabilitating the areas concerned. Appropriate farming activities have been recommended. Different parts of any site have been recommended for any of three major land use types: conservation, pasture and livestock utilization, and cultivation.

RECOMMENDATIONS ON SPECIFIC LAND USES

1. CONSERVATION AREAS

These are mainly areas on hill tops and along the major scarps with slopes of over 12%. Such areas are recommended to remain as natural as possible. In areas where soil had been exposed through clearing, the cleared areas are recommended to be left idle to regenerate naturally or for the lower slopes to be planted with species like **Prosopis juliflora**, **Melia volkensii**, **Croton Megalocarpus** and so on. In any case use of lower areas of the hills requires controls. Where **Prosopis juliflora** is grown, care must be taken to avoid the plant becoming a weed.

2. PASTURE AND LIVESTOCK MANAGEMENT IN GRAZING AREAS

According to present range conditions, most of Mutomo Division, and probably the rest of Kitui, seems to be good goat country and therefore it is recommended that livestock raising be biased towards goats. Most of the grazing should be limited to the foothills and the plains where the slope is less steep to avoid vast detrimental effects to the environment. This would form about 80% of the area. The stocking rates should be around the recommended rate: mostly no more than one livestock unit (LU) to 2 ha. for this area. In most sites, the management of the pasture areas requires improvement where high yielding **Macrostachyus** and **Panicum maximum** should be planted. Legumes for nitrogen fixation in soil should also be included. Agroforestry tree species such as **Cassia siamea**, **Cassia spectabilis**, **Acacia albida** and **Prosopis juliflora** should be planted to assist in the multipurpose usage of the farms.

Some areas need reseeding and rehabilitation. This rehabilitation should be accompanied by development of adequate water supply distributed optimally in the area to encourage even use of the range to avoid localised range deterioration around waterpoints.

3. CULTIVATED AREAS

Since the chances of crop failure in any one year are fairly high, specifically in Mutomo Division, and Kitui District in general, emphasis should be on cultivation of sustainable and subsistence crops. The total area to be under

cultivation in any one year or season should be monitored and limited to not more than 10% of the area to avoid accelerated loss of soil moisture from these opened up areas. It therefore calls for good agroforestry practises to be incorporated. Live fencing of cultivated fields and homesteads with **Commiphora agricana** and **Commiphora erythrae** should be encouraged because they can also supply fuelwood. **Acacia spp.**, **Balanites spp.**, and **Terminalia spp.**, around and in fields for nutrients cycling as well as for supply of poles, fuelwood and as ornamental should be instituted. Other exotic agroforestry species appropriate here are **Cassia**, **Croton**, as well as **Prosopis**. **Mellia volkensii** is also highly recommended in these areas.

In any case, agriculture should be restricted to the plains and less steep areas (slope less than 8%). Drought tolerant and quick growing crops, such as bulrush millet, pigeon peas, beans, cowpeas, and Katumani and Makueni composite maize varieties should be grown. Improved drainage is recommended where appropriate especially in the valleys to avoid the problems of salinization. Terracing is mandatory where the slopes are less gentle and the terraces should be planted with *Panicum colloratum* (makarikari grass).

CONCLUSION

The vegetation of Kitui District is in a dynamic state and the rate of change depends on land potential, population density, land use activities in the areas, as well as on the conservation status and efforts in the area. Land use planning for the area will alleviate prospects of land and vegetation degradation to a point of no recovery.

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WHY AND HOW TO RECLAIM ZONES 4 AND 5 FARMS

**G-C. M. MUTISO
MUTICON**

PERMANENT MIGRATION TO ASALS

Many farmers have moved from the more humid zones to the less humid during the past fifty years. National census data has never, to our knowledge, been analyzed in terms of agro-ecological zones to detail this movement from a national perspective. Since agro-ecological zones do not fit easily into districts, it is important for national development planning reasons that this exercise be attempted. Such an exercise would statistically establish how farmers with one set of agricultural production technologies have moved to areas where their knowledge is not useful.

As shown in Table 1, Zones 4 and 5, make up 20% of the country and are significant for crops and livestock production. The development and at times reclamation of land in these zones is a clear national priority given the exploding population and the need to feed the proportion of the population found in the ASALs with food mainly produced there.

For Kitui district, the development and reclamation processes will have to stretch to Zone 6 where already there is significant farming.

Table 1
AREA BY AGRO-ECOLOGICAL ZONE (AEZ'S)

	%R/EO	Area (Km2) %
Zone 1V		Country area
		Semi-humid
		40-5027
		000 5
Zone V		Semi-arid
		25-4087
		000 15
Zone V1		Arid
		15-20126
		000 22
Zone V11		Very arid
		15
		226 000
		46

Total

506 000
88

Source: Farm Management Handbook of Kenya

Historically, zones 4, 5 and 6 have received population from more humid zones. In the perspective of centuries, it is doubtful whether there were permanent settlements outside Zone 2 and 3 up to the early 18 century as most oral traditions attest. From oral traditions, we know that ASAL production was integrated into the hill/mountain based homesteads through hunting and livestock keeping in syengo in the dry plains. Therefore the issue of continuous use of the fragile ASAL ecosystem did not arise for the institution of the syengo dictated constant relocation of the bases and thus called for discontinuous use of the range resources.

The institution of the syengo was not just for herding. Out of it came major social structure for deployment of labour. Out of it came the major distribution process of livestock and grain consumables. Out of it came the scattering of livestock resources so as to escape drought and disease. Out of it came the then dominant land holding form which assured every family owned mountain and plain land as is found in the traditions of the Kamba, Pokot, Meru, Tharaka, Taita, Mijikenda and so on. These economic and ecological adaptation mechanisms, encapsulated in the institution of the syengo, were marginalised by the population growth of the past ninety years.

In the last ninety years, the populations in ASAL districts have moved from the more humid areas to the drier parts permanently. For Kitui District, this has been the shift from the central, northern and southern hills into the plains. Table 2 below shows the ASAL districts and the percentage of total ASAL area nationally. Similar movements take place in these ASAL districts.

Table 2
ASAL DISTRICTS CLASSIFIED BY DEGREE OF ARIDITY

Category	Districts	% Total ASAL area
A. 100% ASAL	Isiolo, Marsabit, Garissa, Mandera, Wajir, Turkana	62
B. 85-100% ASAL	Kitui, Tana-River, Taita-Taveta, Kajiado, Samburu	25

C. 50-85% ASAL	Embu, Meru, Machakos, Laikipia, West Pokot, Kilifi, Kwale, Baringo	10
D. 30-50% ASAL	Lamu, Narok, Elgeyo Marakwet	3

Source: IFAD/UNDP, 1988

Table 3 below, culled out of recent population statistics, shows recent population movements. Perusal of this table shows that for the intercensal period of 1979 and 1989, nine of the 22 ASAL districts were getting migrants. Thirteen of the twenty two ASAL districts were exporting population. Census data interpretation assumes that the export is to urban areas. It is possible that some of the export goes to other ASAL districts.

Table 3.
DEMOGRAPHIC INDICATORS BY ASAL DISTRICTS

District	1989'000	Pop. Size	Growth Rate	Net Migration 1969-79	1979-89	Change Rate Per 1,000./89
Garissa			+6.85%	+2681	242	+7.01%
			+5.73%			+5.73%
			-			-
			1.12%			1.46%
Laikipia			+7.01%			+7.01%
			+5.73%			+5.73%
			-			-
			1.46%			1.46%
West Pokot			+6.62%			+6.62%

		+5.40%
		-
		1.22%
Marsabit		+1988
		166
		+6.13%
		+5.20%
		-
		0.93%
Lamu		+1647
		73
		+6.47%
		+5.15%
		-
		1.32%
Tana River		+1693
		158
		+5.90%
		+5.07%
		-
		0.83%
Kajiado		+1481
		254
		+5.50%
		+5.06%
		-
		0.44%

Narok	+1349 354
	+5.19%
	+4.94%
	-
	0.25%
Wajir	+1145 235
	+4.80%
	+4.88%
	+0.08%
Embu	+1158 412
	+3.85%
	+4.18%
	+0.33%
Machakos	-34 1587
	+3.68%
	+4.11%
	+0.43%
Isiolo	-61 67
	+3.60%

		+3.98%
		+0.38%
		-79
Kwale		440
		+3.35%
		+3.94%
		+0.59%
		-323
Kilifi		658
		+3.36%
		+3.92%
		+0.56%
		-324
Meru		1264
		+3.30%
		+3.91%
		+0.61%
		-361
Kitui		697
		+3.02%
		+3.76%
		+0.74%
		-531
Taita-Taveta		219

		+2.88%
		+3.67%
		+0.79%
		-719
Baringo		296
		+2.31%
		+3.47%
		+1.16%
		-177
Mandera		141
		+1.10%
		+2.51%
		+1.14%
		-2259
Samburu		102
		+0.95%
		+2.50%
		+1.55%
		-2415
Elgeyo M.		164
		-
		0.65%
		+0.86%
		+1.21%
		-4395
Turkana		147

	-
	12.43%
	-
	0.20%
	-
	1.23%
	-5385
Total ASAL	8198
	+3.81%
	+3.98%
	+0.17%
	-120
National Total	23883
	+3.37%
	+4.00%
	+0.63%
	0.0

Source: ASAL Development Policy Paper Draft 3, 1990.

Generally it is assumed that migrants into ASAL districts come from high potential districts. However, there is increasing evidence that some migrants move from deteriorating ASAL areas to other ASAL areas where the natural resources can still be exploited. This could be in the same district or from one district to another. Nationally, the movement of Baringo residents to ASAL areas of Elgeyo Marakwet at the bottom of the Kerio Valley, the movement of Kajiado residents to Narok, Turkana residents to West Pokot, Taita residents to Kwale and so on are symptomatic of this relatively new phenomena.

However, this ASAL to ASAL movement is not the key movement. In our opinion the bulk is still movement from humid to less humid areas. Those familiar with the post independence history of this country are struck by the major population movement into the so called "ranch" areas of the former White Highlands: the peopling of Yatta Plateau in the past thirty years: the infilling in Kitui in the same period. Next door, in Machakos, the spread into Makueni since 1950s, and the migrations to Kambu, Ngwata and Kibwezi in the past twenty years are dramatic. At the same time one should note the large scale peopling of Kitui Yatta by migrants from the ASAL areas of Machakos.

The historical intra district migration data for Machakos in the past sixty years is shown below in tables 4, 5 and 6.

Table 4:
POPULATION DENSITY BY AEZ 1932-1969

Zone	Sq. km	Ha/person			
		1932	1948	1963	1969
III	1,104	1.11	0.72	0.51	0.47
IV	2,158	2.12	1.6	1.11	0.87
V	5,069	22.7	12.9	6.38	2.93
VI	4,247	80.3	33.3	16.1	8.52
Total	12,578	5.5	3.7	2.43	1.84

Source: Lynam

Table 5:
ACTUAL NET POPULATION FLOWS TO AEZ ZONES

	1932-48	1948-63	1963-69
II			
III	0	-17,250	-28,363
IV	+11,940	+9,736	+17,170
V	+6,772	+19,973	+75,326
VI	+5,119	+7,036	+17,385
Total	0	0	+47,175

Source: Lynam

Table 6:
PERCENTAGE GROWTH RATES BY AEZ 1932-1969

	1932-49	1948-63	1963-69	
III		2.80	2.30	1.60
IV	1.75	2.50	2.25	
V	3.50	4.80	13.7	
VI	5.60	5.00	11.0	
Total			2.50	2.80
			4.80	

Source: Lynam

This Machakos data is only for illustration but several conclusions stand out. First, one should note the deteriorating per capita land holding in all zones. Second is the dramatic peopling of the less humid zones by people from the more humid areas. Third, is the dramatic jump in the peopling of Zones 5 and 6 in the 1960s.

The triple problems of high potential migrants into ASALs, without the necessary ASAL production knowledge, and emigration from ASAL to ASAL, driven by lack of environmentally sound production techniques and deteriorating land potential, and the shrinking land resource per capita, bring to focus the need to systematically reclaim the ASALs and to generate sustainable production techniques for intensification of agricultural production.

ASAL PRODUCTION

The ASALs produce the bulk of the meat products in this country. Table 7 below refers. This point needs constant repeating for many do not seem to appreciate that without the ASAL areas, there would be no meat industry in the country and the national practice of nyama choma, not to speak of the normal national need for animal proteins, would disappear.

Table 7
LIVESTOCK POPULATION 1987 ('000)

	Beef Cattle	Cattle	Dairy Camels	Sheep Donkeys	Goats
ASAL Districts					
Meru				263 96	140106
Machakos			388 249	34	96
Kitui			304	6	68
Embu				535 61 106	37 26
Narok					801
					34

			436
			423
E Marakwet	101	337 137	129
Baringo			146
			103
			49
			129
			649
			1
Kajiado			3
			608
			2
			500
			449
Laikipia			12

				217
				25
				297
				267
				1
				1
Kilifi	169	17	23	
	160			
Lamu		44	4	
	8		15	
T Taveta	140	9		50
		155		
Kwale	223	11	67	
	131			
T River				
				444
				159
				293
				52
				2
W Pokot				
				170
				10

	190
	120
	1
Marsabit	1
	315
	401
	425
	227
Isiolo	23
	203
	178
	119
	424
	52

Turkana

208

720

1080

10

Samburu

5

155

163

253

14

Mandera

10

126

110

714

	12
Wajir	4
	25
	180
	220
	153
Garissa	3
	693
	100
	678
	61
	4
Total ASAL	5761
	715
	4144

				7283
				956
Total Non ASAL	3310	2287	2300	249
	1245			
ASAL as % of Total				64
				24
				64
				85
				100
				100

Source: Agriculture and Livestock Data, MOPND Long Range Planning, June 1989

Although ASALs produce subsistence crops for their population, one of the really serious national food statistical omissions is the lack of a coherent picture on the contribution of ASALs in crop production. However Table 8, shows the MOA estimate of food production potential of the ASALs. Although potential can be estimated, it would be more useful for development planning if actual production figures were collected and analyzed. What is not disputed is the fact that the bulk of the bean, cowpeas, pigeon peas, simsim, millet, sorghum is produced in the ASALs. These form a major pillar of national food consumption.

Table 8
ASAL POTENTIAL CROP PRODUCTION

Crop	Kg/ha	Hectares	Yields
Maize		200000	400
		700	
Sorghum		30000	800
		1200	
Millet		22000	800
		1500	
Beans		88000	300
		500	
Cowpeas		20000	300
		500	
Pigeon peas		30000	200
		400	
Green gram		15000	200
		300	

Source: Agricultural Development in ASAL, MOA, Nairobi, 1990

ASAL LAND SHORTAGE

Land is becoming short in the ASALS. Table 9 shows average land holding by district in selected districts. It always is important to peer behind the statistical averages to get an idea of effective land holding. For Kitui the data in Table 9 shows average holding as shrinking from 0.89 to 0.50 hectares between 1969 and 1989.

Table 9
AVERAGE LAND HOLDING SELECTED ASAL DISTRICTS (HA. PER PERSON)

District	1969	1979	1989
Narok	7.32	4.30	2.66
Lamu			3.36
			1.76
			0.98
Laikipia	2.09	1.03	0.55

Kitui	0.89
	0.66
	0.50
Kwale	0.79
	0.57
	0.42
Embu	0.58
	0.39
	0.28
Kilifi	0.53
	0.38
	0.28
Taita	0.45
	0.34
	0.26
Machakos	0.40
	0.28
	0.20

Source: Livingstone, 1989 Quoted in ASAL Development Policy Paper Draft 3, 1990.

Average statistical data needs to be refined by analysis of the pattern of land holding in the district. We reviewed the Kitui District adjudication record of the past 20 years in attempting to go beyond the mere statistical average. The review shows that a total of 1,714,194 hectares out of the district's 3,109,900 hectares were adjudicated. This volume of land was divided into 39,290 parcels. The average parcel was just under 44 hectares. Assuming that each parcel represents a family of 8 then the per capita land holding is only about 5 hectares.

This average is also not meaningful for adjudication took place in the two extreme poles of land use in the district. It started in the high potential and thus extremely crowded areas of the district and at the same time adjudicated the massive ranches. For example in the Mutune Adjudication section 918 hectares were adjudicated into 1023 parcels for an average parcel size of 0.90 ha. Another example is Kauma Adjudication section where 199 ha. were adjudicated to 1558 parcels thereby producing an average parcel size of 0.13 ha. At the other end of the past adjudication is Mutumbi Ranch with 59,664 ha. which was adjudicated to one parcel or Nguni Ranch with 9,379 ha. also adjudicated in one parcel.

Since adjudication is far from being completed, it will not be possible to establish the actual land holding per household and per capita. If the catchment approach is adopted, data can be collected in the catchments to

refine data on farm size and to elucidate variations by zones per capita. For land use planning, it is the farm size which will be critical and not the statistical average land holding.

On the whole, it can be argued that the average family land holding and thus per capita holding is shrinking. This land shrinkage presents tremendous challenges for sustainable development and intensification of ASAL production since the farming systems have not addressed the key issues in any intensification, ie fertilisation of the soil, labour saving tillage and handling equipment and utilisation of water harvesting for production and perhaps most complex integration of crops and livestock production so as to capitalise land rather than mine it.

The point one wants to make is that there is not much land per capita in Kitui. It is therefore important that systematic improvement of the land as well as reclamation be speeded up. This can be done only if the farmers get techniques which facilitate the improvement of the land.

MAKILA: TRIBULATIONS OF A MIGRANT DEVELOPING A ZONE 5 FARM

One of the most frustrating things for a farmer is to get conflicting information from both the extension system and the published materials on how to reclaim land in Zones 4, 5 and 6. This is more so when the farmer is a recent migrant from Zone 3 and has no experiential knowledge to fall back on. It is not good enough that the farmers be left to pick experiential knowledge over time for the land resource will deteriorate very fast.

The balance of this paper is in the form of a diary of a farmer who for the past twenty years has struggled with the problem of reclaiming ASAL land in Makila Village, Kwakala Sublocation, Wamunyu Location of Machakos District. He migrated from the coffee zone in Machakos. He is not resident on the plot. However his experience may throw some light on the strategies necessary for reclaiming Zones 4 and 5 and possibly 6.

Using Jaetzold maps and data Makila formal statistics are as follows:

Average Rainfall estimate 600mm

60% Reliability of Rainfall Long Rains 200mm

60% Reliability of Rainfall Short Rains 200mm

Agro-ecological Zone LM5 ie Livestock and millet Zone with very short and a very short to short cropping season.

This is all the formal written up data on the region the farm is located. The nearest rainfall gauge is in Wamunyu Chiefs centre 10 kilometres away. It is

not to be trusted for often it rains there without a single drop in Makila. Soils have not been analyzed.

1970

This land, measuring of 22.5 hectares, was bought in August 1970 for Ksh.16,000 for it had already been adjudicated and the title deed was available. It was bare and panned. The buyer farmer was a migrant from the coffee zone of Kangundo Location, Machakos District, where he could not get land to buy.

Since the farmer was a migrant, and since the parcel had been in dispute during adjudication, the neighbours felt that it should be used as commonage before he could organise himself. Since 1970 was a localised drought year, all the neighbourhood cattle tramped through the land on their way to the survival grazing on the Athi. The big mother (and father!) A. Tortillis trees were cut for fodder for goats. The large A. Mellifera were cut for charcoal. So were the munina wa usi. When the farmer returned to the plot in September, it was not only bare of grass, but was bare of any large trees.

There were three parts on the land which had been cropped before. Since the piece had been disputed during adjudication, they had not been cropped for about four years. The dominant colonising tree in the maei (fallow land) were A. Tortillis spread by the goats.

1970 Short Rains

The farmer fenced with brush by contract. This led to devastation of the few remaining trees for the contractors were, unknown to the farmer, also felling the bigger trees to use in charcoal burning.

About two hectares were ploughed by tractor. An attempt to plough, before the rains in September, was a failure. The red soil was too hard. The tractor owner argued that nobody ploughs new land on red soil in the location before the rains. After the onset of the rains, the land was ploughed, or better, the mud was rolled around. In any case beans, cowpeas, pigeon peas, and maize were planted as the tractor was ploughing for the farmer was aware, from literature, that according to the MoA, since Dowker's work in Katumani, the major bottleneck to production, in the zone was early planting. Besides there were no oxen for hire, or community members (mwethya) for the planting. Migrants are not speedily integrated into the social network of mwethya.

It goes without saying that the crops were a failure. There were no terraces to maximise water retention. The seeds were probably buried too deep. The tractor compacted the land. The short rains failed, part of the beginning of the under normal rainfall which was to last until 1978.

1971 Kathano

The farmer approached the local TA for laying out four terraces. One kyambo (25 feet) of terracing 2 feet by 3 feet cost Ksh. 25. These were done in Kathano (short dry period in January/February). No crops were planted.

1971 Long Rains

The farmer managed to get a tractor to plough the terraced land before the rains. Maize, beans, cowpeas, simsim, sweet potatoes and cassava were planted separately. Planting was by hand and it was done by mwethya for the farmer was beginning to integrate into the community. Weeding was by hired labour for the family was not domiciled there. They are still Nairobi based. Planting was late for each person living in Makila first plants before they begin the mwethya for assisting cripples and migrants. The beans and maize were a total failure for the planting was late.

Sweet potatoes and cassava survived. They were an innovation for nobody else grew them. The farmer had got the idea from the ALDEV records of Makueni. However, since there was none in the region, he had collected planting material from Kangundo. Somehow they were not adapted to the region and yields were dismal. Vermin had their fill though. There were no family members to watch over the vermin. Employed staff always had arguments that vermin, especially monkeys, were smart and attacked when the staff went for lunch, were looking after cattle and goats, were repairing the fence or sleeping at night. After all employment is a 8-5 affair. It is more so when the owner lives in Nairobi and is a migrant.

The terraces broke.

50 goats were bought in Kithimani and Makueni. 50% of the Makueni goats died. Two heifers and a bull were bought in Yatta. They were Eastern Kitui Boran. Four milk cows were donated to the farmer from family traditional obligations. Three of them died for they came from the relatively tick free area of Kangundo. Ticks were endemic in Makila and there was no dip for miles.

1971 Thano

This was a particularly dry period. The cattle and goats were emaciated. However, proximity to the Athi meant that they could get some green fodder in the river channel. They survived. The farmer bought one of the original coffee spray pump from a Kangundo farmer who had given up on coffee to be spraying livestock. This was on advise of a new migrant neighbour who works for a multinational veterinary company. The later migrant

recommended getting a Galla buck from a farmer in Kibauni, the next location. One was bought and the foundation breeding was started.

The TA recommended that the farmer buy Makueni and Mbarara Rhodes and scatter it in the land on the onset of the rains.

1971 Short Rains

There was no tractor available for ploughing, since the tractor owners had moved their tractors to plough in Kanyangi, where migrants from Wamunyu were opening new farms. The farmer bought a plough. Ploughing was done by mwethya who got to use the farmer's plough on their land by way of payment. Cultivation by plough was done by mwethya.

The farmer got the first crop of maize (6 bags) and beans (10 bags). The lesson seems to be not to put tractor on land for the ploughing system produced a crop and reduced costs since those neighbours without a plough use it as payment for planting and cultivating. Oxen are borrowed from neighbours, who then use the plough.

The repaired terraces broke again. The neighbours informed the farmer that all the terraces measured by the young man, who trained in Embu always break. They recommended to the farmer that he goes to get a retired TA who started work in ALDEV days. The catch is that he is paid 20 shillings a day. The MOA TA is free but he insists on nyama choma which in any case comes to about the 20 shillings charged by the other.

Makueni and Mbarara Rhodes does not grow. More than 75% of the grazing land is still bare.

1972 Kathano

ALDEV TA realigned all the previous terraces. They are more than four feet off. He explained to the farmer that the terraces were measured for spilling water away from the land rather than retaining it. He recommended the Makaveti Square Mile (circa 1952) measuring technique where the terraces are aligned for retaining all the water on the land. He further recommended collecting water from the two roads passing the farmer to increase the amount of water on the land.

ALDEV TA recommended terracing grazing land for he was convinced that grass would not grow until water was retained. The alternative was to use a chisel plough which he remembered from ALDEV reclamation of Makueni. The farmer had seen such a chisel in the World Bank Baringo Project. It was the only one in the country and had been imported from Argentina. Since that option was closed, four terraces were added in the grazing land.

Terracing a kyambo length has gone up to Ksh. 35.

ALDEV TA recommended cutting brush and compacting it in the gullies some of which are ten feet wide. This work was started in the big gullies.

1972 Long Rains

Neighbours extensively collected cassava cuttings for planting for they were "sure" there would be a drought. Rains were erratic. Beans were replanted twice. Still they did not produce a good yield. Maize crop was eaten by monkeys from Yatta.

Grazing land which was terraced shows spectacular growth of Nthata Kivumbu and Mbeetua as well as Mbarara, Makueni and, of all things, Nandi Setaria, where water collects at the soil is thrown up and at the gullies filled with brush. Most of the bare patches, still about 70 % of the land, got lamuyu (an annual grass) growing in scattered clumps.

The farmer brought on the land a grass specialist, from the Faculty of Agriculture, who had studied in Australia and who was involved in breeding bana grass to get an assessment of what grasses to plant given the past failures. He identified the grasses and did not recommended buying any more of the commercial grasses for they would not be as good as nthata kivumbu or mbeetua or kithuku.

The farmer planted eucalypts and grevillea, leucaena and pines etc. They all dried.

Thano 1972

Nthata kivumbu still green although by all accounts it is an abnormally dry year.

ALDEV TA recommended that rather than waste money on planting new trees, all wildings germinating on their own should be pruned extensively. This was done.

1972 Short Rains

The rains were again low. The grazing land terraced filled with native grasses. The Mbarara and Makueni Rhodes and the abberation of Nandi Setaria are gone. They did not survive the thano.

Almost given up on maize and beans. Problem is organising labour for planting and weeding, oxen or tractors for planting and keeping watch over vermin. Only planted the first four terraces. Made decision to concentrate on animals and look around for cash crop to irrigate.

The pruned *A. Mellifera*, which were just low bushes, about half a metre from the ground, grew by a metre. The *A. tortillis* grew by about half a metre. Other species like *terminalia brownii* shot up so fast that we could not measure them.

1973 Kathano

Animals are doing well. Sold about 40 goats. Grass is filling. The old masyuko (cattle trails), other than the patches with kivuthi (gravel) have not got any grass yet. The pruned *A. Mellifera* stayed green longer than those not pruned. They flowered more. The *tortillis* produced more pods if pruned.

Completed terracing half of the land from the top. There is no water getting into the gullies. Where brush was put in, there is grass. The sides have been falling in and the gullies are healing themselves now.

Started taking out the anthills. Ten were dug up and taken out. Since the charge is twenty shillings per ant hill, it was decided to cut small channels to the anthills and to let the runoff get into them thereby killing them.

1973 Long Rains

Planted maize and beans with the usual labour problems. They were eaten by monkeys from Yatta. Planted exotic trees which dried.

The animals are doing alright. Got a Boran/Sahiwal cross bull from a neighbour. Good native grass even in the lower parts not yet terraced.

1973 Thano

Issued a contract for clearing sodom apple and other shrubs in the grazing land. The TA passed by one day and on discussing burning said that the law prevents burning and if the farmer burned deliberately, he would prosecute.

The University grass specialist had argued against burning for it would destroy grass seed, which was scarce then, and young indigenous trees. The farmer sees no logic in not burning to control bush and ticks as is argued by Samburu, Maasai and Kamba oral traditions.

For the first time, some of the young *A. Albida* (mung'ole) seeded. There are only about ten of these trees in one corner of the farm. The big mother trees had been cut for charcoal.

Bought ten beehives and put them next to the river. Surprisingly bees settled in the middle of the dry season.

Tree planting holes were dug to plant trees especially in the designated home compound.

1973 Short Rains

The farmer looked for indigenous tree seedlings and could not get any, either from the Forest department or private nurseries in Nairobi.

The holes which were not planted with trees got a lot of grass. When the ALDEV TA passed by he told the workers that there were **wamatengo pits**, After the Wamatengo tribe in Tanzania, which they dug to rehabilitate the impossible patches during his ALDEV days. He recommended that in those areas where nothing was growing, we dig pits arguing that they will get as thick grass as the unplanted holes. Later the farmer read about the **zia** holes for planting millet in Burkina Faso, and tried both systems.

1974 Kathano

Nothing much was done on crops. The wamatengo and zia pits were expanded in those areas where the grass was not coming in.

1974 Long Rains

Again there was nothing much done on crops for the farmer was away. The grass in the pits did spectacularly well.

1974 Thano

Nothing was done for this was one of the worst drought years in the region. Concentrated on building.

1974 Short Rains

The traditional trees were now big. They were five to six metres above the ground and the canopy was beginning to touch. About 95% of all grazing land is now covered with grass. Where the trees have created a canopy, especially where the dominant species is *A. Mellifera*, there is fantastic grass. Thirty goats and ten sheep were added to the stock. Goat prices have dropped for there really is a famine. The livestock seems to do well.

1975

All year efforts were put on building a home and a massive water tank for supplementary irrigation of oranges. Farming of the minor four terraces concentrated on beans. The crop land is exhausted already. There is no manure for it since we want to use it for the oranges.

ALDEV TA argues that it is the tractor ploughing which has compacted the soil. The recommendation is that there should not be any tractor ploughing in the rainy season.

1976 Kathano

Expanded the cleared land to get space for 1,000 orange trees.

1976 Long Rains

Planted 500 budded oranges and lost more than half to white ants. As supplementary water was put, it seemed as if all the ants in the region came for water under the trees. Put all the recommended ant killers bought from KFA but still the ants got the oranges.

1976 Thano

Redug the 300 holes and put chemicals for killing white ants. Dug up 500 more holes. Spent a lot of money on the ant killers.

1976 Short Rains

Did not replant oranges for the rain was very poor.

1977 Kathano

Continued to prune trees.

1977 Long Rains

Replanted and planted oranges. Planted beans between the oranges to increase the land productivity. Weeding became a major problem for the oranges were not in neat lines to facilitate cultivation using the plough.

1977 Thano

Concentrated on saving oranges by watering and mulching. The grass is very good. Sold some animals. The economics of the farm are dismal. Too much labour cost and very little return yet.

Visited by an Israeli trained orange specialist, from the DAOs office. The planting distances were too crowded for the region according to him. When we went to the DAOs office in Machakos, he had given us a specialist TA who knew what distances to keep. He was the one who laid out the holes. Now they are crowded for the moisture in the region.

1977 Short Rains

Concentrated on spraying and cultivation of oranges.

1978 Long Rains

There was very good rain. It started early in March and continued to July. The grass and the trees look fantastic. The oranges are good at the beginning of the season. The local TA gave us fertiliser for the oranges. We put about five spoonfuls under each tree.

No crops were planted for the labour of cultivating for the oranges is too much.

1978 Thano

The oranges are wilting although they get four litres every week. ALDEV TA argues that the cause is the fertiliser.

To increase the amount of water into the oranges, all storm water was diverted to those terraces with oranges from the road. ALDEV TA showed how it was to be done. Since the lower parts of the land were covered with grass he argued there would be no erosion.

1978 Short Rains

The rains came early and persisted. Storm water was collected in the terraces and no soil was detected leaving the farm. Even in the depressions of the former gullies, no evidence of erosion was detected.

Ten or so orange trees flowered.

Grass, especially Nthata Kivumbu is filling all the parts. In the pitted areas, there is complete coverage of grass.

1979-1990

All oranges dried in 1981 basically from white ants. It is estimated that the loss amounted to half a million shillings. It seems as if the main cause was the fact that supplementary irrigation attracted ants to collect water at the base of the oranges and they fed on the roots. The farmer was absent for a period of six months in 1981 and thus cannot vouch for the diligence of putting ant killers.

By 1979, the land had been totally rehabilitated. The indigenous trees, dominated by *A. Mellifera*, had created a micro-climate and at times it appeared as if the rain stagnated over this farm and skipped the neighbours. Many times the farmer has watched when it rains on the land and the rain skips neighbouring farmers where during the decade of the seventies, all trees have been cut for charcoal leaving the ground not only bare but eroding.

The carrying capacity of the land has obviously improved tremendously. Each year, at least 4 head of cattle and 30 small stock are sold, with an average return of about Ksh. 30,000. Given the fact that their management is easier than cropping, the farmer has decided to concentrate on this for given his

base, it is not cost effective to be running up and down organising planting, vermin control and weeding. Yet that does not say that one cannot produce a decent crop for subsistence and sale. On the fallow terraced land, Nthata Kivumbu grows to above a metre. The only other place the farmer has seen that growth is in a project in Baringo where it grew up to two metres under a system of road grader microcatchments on silt.

The farmer has introduced other species of indigenous trees and shrubs. Among these are Sesbania Sesban, the idea came from a project in Western Province. A. Albida has not only spread but seed from as far away as Senegal and Malawi has been introduced. Perhaps in the long term there may be different varieties of this useful tree. The farmer has failed to get other nitrogen fixing shrub seed for there are no commercial seeds. Mesquite was introduced and only three trees are left. They grow at a snails pace compared to the indigenous ones. This contradicts the notions from many ASAL projects on this tree. Besides as is clear in Baringo, it is too tasty for the dudus which attack indigenous acacias. Other indigenous trees like Tamarindus Indica have been successfully introduced from a nursery run by a Kitui woman in Nairobi!

UNRESOLVED ISSUES

1. TREE PRUNING AND MANAGEMENT OF NATURAL GROWTH.

If there is any clear lesson to this migrant farmer, it is that one need not plant new trees to get reforestation. By extensive pruning and protection from goats, by tying sticks around the protected tree, one is assured of reforestation. It is rapid. The terraced fallow land (ex-oranges) has taken six years to get a continuous canopy. The operational question is then, why spend resources on nurseries and planting when the cheaper protection can lead to less costly reforestation with adopted species? In case some argue that no new species are found under this system of reforestation, it is interesting that so far we have identified ten species which are not in the region. They have been introduced by natural dispersal methods. An inventory of what is there now will be done later.

2. IMPROVEMENT IN MICROCLIMATE

One of the detail points which is not trapped by the data culled from Jaetzold, the bible in Kenya agriculture, is the localised effect of being in proximity to the Athi River. We mentioned that at times there appears to be localised rain on Makila. Explanations for this range all the way from witchcraft to effects of the moisture from the Athi channel. What is clear is that the vegetation, shrubs, grass and trees, stay green longer on Makila than on other farms

adjoining. Temperature is lower during the hot periods. Obviously the trees have an effect. Obviously reforestation with *A. Mellifera*, *A. Tortillis* and *A. Albida* allows other superior native grasses to get on with it enabling the farmer to improve his carrying capacity.

3. LARGE SCALE WATER HARVESTING.

Those who push water harvesting usually emphasize the small scale techniques. Yet the diversion of road water into the terraces seems to have had very high contribution to the improvement of grass, trees and shrubs. The **wamatengo and zai** techniques became useful on areas not healing naturally. Is it time operational questions centred on structures which enable a farmer to harvest from roads etc?

4. BUSH CLEARING

This is expensive. The farmer plans now to start controlled burning for the returns on labour expended in this are dubious. Is it not time the law was changed? An unresolved issue is how much bush does one need for mixed livestock keeping? Is there data? This has been discussed extensively with livestock specialists by the farmer but there always is the comment that one needs to maximise grass. This can only be true if one is interested in cattle alone. At one time the farmer allowed goats to increase up to 100. Their condition was excellent. Does this not suggest the way or are we to continue being trapped by the colonialist anti-goat bias?. Incidentally farmers who have bred friesians suitable to the same zone insist on grazing them together with the Friesians to control bush.

5. TILLAGE

There is a technical problem about tillage. The disc plough is limited for during the dry period it just scratches. During the wet season it compacts too much. The mould board plough, the farmer is told, turns the soil too much. Chiselling and harrowing equipment are not readily available. Is this an issue for development projects?

6. THE MAIZE TRAP AND OTHER CROPS

Given the preference on maize, driven by the shortage of labour for scaring birds necessary if one is to grow millet or sorghum, what is the solution? More suitable maize or more water harvesting? The farmer even planted Variety 511 and it did well. The catch is that it was in an area receiving water from the road. Other upland varieties were tried and they did as well as the local varieties and out performed Katumani. Extrapolating on Heyer's

research and changes in the 1960's Lynam makes a major point that it was the katumani maize technology which enabled farmers to move into Zone 5 and produce a subsistence crop. Yet all the successful farmers in my location have refused to adopt Katumani. They argue that their own selected seed, based on the Muranatha seed from around 1940, does better, by maturing earlier and producing more as well as tasting better and thereby commanding a better price locally. Katumani needs fertiliser which they argue dries the farm. Is there need to re-evaluate this technology given the problems of fertiliser availability, costs and problems with the soil structure?

Seeds for other crops are not easily available. The better farmers select. It is worth noting that they have tried the sorghum which is "bird proof" but problems with labour for harvesting when the crop is ready leads to the sorghum being eaten like the traditional one. Farmers have also tried the short season cow pea. It has been rejected because many pests eat it.

Extremely dramatic is the fact that some of the poorest farmers in the sublocation get the new Katumani releases of beans systematically. The supplies are through informal channels and not regular extension. Some of the lines not even released are found in the farms. The reason must be that beans do very well in the region and procurement and management resources into beans are much higher than all other crops. The conclusion one draws from this is that farmers will invest in the crop with returns given production limits. In Makila the crop is beans.

7. SOURCES OF INFORMATION AND TECHNIQUES

In the mad journey of being transformed from a person who understood Zone 2 and 3 production to coping with Zone 5, the extension system was not particularly useful. In fact some of their techniques were dangerous. Witness the breaking terraces, the fertiliser stressing the oranges because of fertiliser application, the badly spaced oranges. The irrelevance of the grass recommendations and so on. One got more useful tips from the retired extension TA, whose memory went back to the ALDEV experimental work in the 1950s. In short, there is little information coming from the agricultural research and extension which is of clear application. If it is coming, it is not easily available in published form a farmer can buy, read and use. Is then not time all ASAL projects got into producing information on all known techniques to build a knowledge base for those farming in Zones 4, 5, and 6.? The codified national agricultural knowledge system is essentially for Zone 3. It is time the nation codified agricultural knowledge for ASALs.

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SUMMARY OF THE KITUI INTEGRATED DEVELOPMENT PROGRAMME SEMINAR

MUTICON

Day One - Monday 27th May 1991

At the end of Mr. van der Zee's presentation and two hours of intense discussion, it was recommended that to combat the degradation of physical and social structures in Kitui, it is necessary to integrate the activities of the different Government of Kenya (GoK) departments and donor development activities into the communities by:

1. Planning, implementing and evaluating development activities by technical officials and the community.
2. Educating the communities on technical matters relating to physical and social breakdown and strategies for combating the two.
3. Developing of overall development strategies by the technical personnel of either GoK or Donor Agencies, together with the communities in dialogue - since the communities are ultimately responsible for their own development.
4. Technical personnel paying attention to communities' social structures.
5. The catchment approach should be useful in not only integrating physical and social catchments for development but in demarcating manageable units for implementation.

Day Two - Tuesday 28th

At the end of Mr. Finkel's presentation, 1. It was agreed that Mutomo Soil and Water Conservation was the most successful ASAL water supply programme in Kenya and East Africa and it offers many relevant experiences.

2. There were issues raised about the determination of technique for ASAL water supply based on the offered unit cost calculation. On the unit cost calculation, local labour is undercosted. Beyond this, different techniques offer other environmental and landuse capitalisation economic advantages not reflected in the monetarist calculation. Since development of water supply has to fulfil these other requirements, they must be factored in where monetary calculations are to be used to select some specific supply techniques.

Mr. Ogongo's presentation and the discussion which followed made the

following conclusions:

1. The major handicap to the full utilization of human resources is the high degree of illiteracy, traditional values, attitudes and practices that may be inconsistent with modern values and practices particularly with regard to changes necessary for modern development.
2. The needs and aspirations of the people can be best articulated at the sub-locational and locational levels through strengthening of the local level development committees through relevant training and appropriate staff deployment.
3. The catchment approach to conservation of resources, which is promoted by both the Ministry of Agriculture and KIDP, is a feasible and realistic strategy for the promotion of conservation of resources.
4. Animal products could easily be processed in Kitui with finished or partly finished products being transported to Nairobi and other markets for either consumption or further processing.
5. The improvement of rural infrastructure however, will help stimulate agricultural and non-agricultural activities in rural Kitui. Poor infrastructure, particularly roads, can be a major constraint to the development of commercial and agricultural activities.
6. There is an urgent need to speed up land adjudication in the district so that the farmers can have land certificates which they can use as collateral security for financial loans to improve agriculture and non-agricultural economic enterprises.
7. There is an urgent need to change public officers' attitudes towards work generally and towards public facilities and equipment.
8. The District Development Committee should recognize the complementarity of various sectoral plans and programmes. This calls for the cooperation of all sectors, departments and agencies that operate in the District.

Mr. Omokamba made the following recommendations:

1. Preparations of baseline data on catchment areas should be carried out to facilitate decisions and implementation which is sustainable.
2. The communities should be involved in the planning of the catchment

areas right from the beginning.

3. All ministries and actors in the catchment should coordinate and collaborate for effective implementation.

Mr. Peter van Dongen's presentation was heartily welcomed by the group for it emphasized that from aggregate macrodata, there is enough water in Kitui for domestic and production purposes for now and the future if harvesting techniques are implemented. However, the group would like more rainfall and water discharge monitoring programmes so as to produce data for specific locations to enable rational water resources utilization planning.

Since some water extraction techniques have supply production and rehabilitation contributions (specifically sub-surface and sand dams, whose impact on ground water recharge and river maintenance as well as revegetation, minimisation of localized waterpoint desertification and creation of many supply points), it was the conclusion of the group that they should be emphasized. They are easily integrated into the catchment approach and should be emphasized for their implementation and maintenance can be done by the community.

Mr. Sinange's and Mr. Agatsiva's joint presentation was welcomed for it had the potential to give the district a strategy for establishing vegetative rehabilitation needs. However, the group would like the revegetation proposals to be specifically detailed in terms of tree, shrub and grass species to be used in 1. cropland and 2. grazing land. The authors promised to address these issues in the redraft for the final conference paper.

Day Three - Wednesday 29th

The following points on livestock development in Kitui were raised by Dr. David Kimenye:

1. Disease control and not cure should be emphasized. Disease reporting and the capability of vets to contain epidemics should be enhanced.
2. Livestock census and information on livestock marketing should be done to give a clear picture of the current populations and assess restocking or destocking needs.
3. Action should be taken to safeguard the livestock producers against very low prices offered by the livestock bookers found in the market places. Livestock auctions might be the answer to these low prices being offered.

4. The potential of dairy cattle in the Kitui central highlands is high and should be exploited for the supply of milk to Kitui.

On the promotion of oil crops development, Mr. Larry Ngutter raised the following issues:

1. The dependency on imported oil results in national exposure to this important commodity. It is therefore important to come up with a policy for development of edible oil production as a part of national food sufficiency.

2. The development of the livestock industry is dependent on the availability of stock food. Oil-seed cake, a by-product of the oil industry is necessary in the formulation of stock feed. Oil crops will therefore support the livestock industry.

3. The returns for oil crops to the farmer are minimal. Prices for these crops should be improved for their promotion.

4. Promotion of oil crops in the rural areas should be undertaken as a means of industrialisation of the rural areas. This would ease the pressure on and migration to the cities.

In his paper "The Demographic Time Bomb", Dr. Kisovi made the following recommendations:

1. Since the focus of all developmental activity is the people, the relation of the population to the resource base should be established to attain a perception of the socio-economic aspects pertaining to a community.

2. Family planning activities need to be promoted vigorously due to the danger of the destruction of the ecosystems due to high population pressures.

3. The current farming technologies are not capable of carrying an increasing population, therefore, adoption of suitable technologies is necessary to feed the population.

4. A change of attitude from the reliance on the government to supply food during droughts towards self-reliance and development of strategies to achieve this.

The description of the only attempt in participatory approach to development in Kitui by Mr. Mulyungi was received by the seminar with interest. A few individuals wondered as to the possibility of this approach being used by

government departments.

Mr. Kulman presented a first draft of his own ideas as to how KIDP could use the participatory approach, particularly borrowing from the Kitui Diocese. Given the fact that these ideas had to be first discussed between KIDP and the Ministries, decision on the final format was deferred.

PLENARY SESSION CONCLUSIONS

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Objective: Which way is Kitui going, which way do we think it **should** go and how can we make it go this way?

1. Agriculture

The key issues in Agricultural Intensification are:

- Water harvesting
- Improving vegetation
- Improving oil crop marketing system
- Introduction of mulberry trees
- Introduction of mangoes as an industrial crop over being a subsistence crops.

2. Water

People have not thought of water in a systematic way due to lack of a planning base. Funding should be extended to areas where it is required e.g. supplying market centres with water. The idea of farm employment versus water development is highly questionable and should not even arise. Water supplies go hand in hand with water conservation.

3. Livestock

Disease Control

The major concern is how to implement district-wide coverage in terms of the linkage between disease control and livestock marketing. This can be done through the development of stock routes via established holding grounds in which animal health can be taken care of. The market centres must be improved.

Animal production

The Cockerel exchange programme should be monitored and a strategy developed. Improved community participation will help to solve the problems associated with animal production e.g. establishment of fodder crops.

4. Participation

This should be seen as every sector's work but not as MoCSS' work alone. Community participation should be seen as an important element of project implementation and a strategy should be developed on how each sector fits in.

5. Conservation of environment/vegetation

There is a need for:

- Conservation and management of traditional woodlands.
- More emphasis on agroforestry in catchments.
- Introduction of appropriate exotic trees.
- Introduction of bee foliage.
- Introduction of appropriate crops.
- Emphasis on a schools approach programme.
- Introduction of income generating activities.

6. Seminar for District Staff

The seminar is to be repeated in 6 months time from now by the Ministries in the form of case studies.