PART II

PRODUCTION POTENTIALS AND DYNAMICS OF AGRO-PASTORAL SYSTEMS

2. The Agricultural Production Potential and Production Strategies in Kibwezi Division of Makueni District

D.M. Nyariki and N.K.R. Musimba[*]

Introduction

Agriculture is the mainstay of Kenya's economy and supports over 70% of the population. Of the country's 750,000 sq. Km, only 7% has adequate and reliable rainfall, soils and topography suitable for crop production. A further 5% can sustain crops in years of adequate rainfall. Hence the rest, over 80%, can only support livestock without adverse environmental strain under alternative use such as irrigation (ILO 1972, Pratt and Gwynne 1977). These semi - arid areas of the country, now called Arid and Semi - Arid Lands (ASAL), constitute the so-called rangelands - described as "lands carrying natural vegetation and due to certain physical limitations such as climatic conditions, soils, topographic and other ecological conditions are not suitable for crop production but rather for livestock production whether domestic or wild. They can also

[*] Department of Range Management, University of Nairobi.

be sources of other natural resources such as wood and wood products, minerals and also water."

The Kibwezi Division of Makueni District comprises mainly ASAL except for very few isolated highland areas which are conservation areas such as the Chyulu range, also called Chyulu catchment. The Kibwezi Division lies at the south-eastern part of Makueni District and comprises of Makindu, Kikumbulyu, Mtito-Andei and Ngwata locations. It is characterised by considerable differences in precipitation within the range of 600-700 mm mean annual rainfall with 66% reliability during the growing season.

Production Potential and Strategies

Data was collected in the Kibwezi area at different times to obtain base-line information on agricultural resources, production parameters as well as common practices (Nyariki 1993; Musimba 1994). Farming in the Kibwezi dates as far back as 1938 in the Kikumbulyu and 1942 in Ngwata locations. In earlier surveys, it was reported that over 70% of the inhabitants of Kibwezi were migrants (Nyonyintono 1986).

Mean farm size ranged from 12-14 acres with over 50% of the inhabitants holding between 3-10 acres. Land tenure was mainly free hold as the majority of the land was crownland. Very few farmers held large tracts of land which they had acquired over time through buying or simply staking claims on previous government lands.

Crop Production

Staple food crops produced included grain cereals such as maize, sorghum, millet and legumes like pegion peas, cow - pea, green grams and beans. Other assortments of crops such as cassava, tree crops, and horticulture crops and vegetables were also raised. Horticulture is recent in the Division dating as far back as the 1970's, when economic production systems of irrigated agriculture were introduced along the main rivers such as the Makindu, Kibwezi, Athi and Mtito-Andei. Except for the Athi River, all the rest of the rivers originate from permanent springs whose source of water is the Chyulu catchment in the south-west of the Division. As can be seen in Table 1, it can be clearly concluded that production was geared to subsistence as the large part of the farms was dedicated to food crops such as maize and an assortment of legumes. Only a very small portion was allocated to horticulture and vegetables for commercial purposes.

Table 1: Production of various key crops in Kikumbulyu and Ngwata locations (N = 160)

Crop	Acres	Yield	%	Uses	% Best	Season
		in bags	D	S	LR	SR
Maize	5.6	21.3	97	3	43	57
Sorghum	1.6	2.4	94	6	48	52
Millet	3.1	3.8	91	9	50	50
Pegion Pea	4.9	4.8	98	2	62	38
Cow peas	3.9	3.6	99	1	32	68
Horticulture	1.8	1.8	67	33	12	88

Livestock Production

It was found out that, in general terms, about half of the land holding was used for grazing with a minimum of 3 acres and a maximum of 8 acres. The livestock types raised were cattle, sheep and goats. Other types of livestock kept were rabbits and chicken. The number of animals per household varied a lot but overall means were as follows; cattle 5; sheep 5; goats 8; chicken 16 and rabbits 4. Most of the animals were local breeds of cattle, sheep and goats. Nyariki (1993) reported that livestock production was secondary to crop production, while Musimba (1994) reported over 20% of the farms favouring crop production against 1% favouring livestock enterprises. A large number of farmers, however, favoured both types of crop - livestock production.

Livestock management strategies are mainly traditional using natural grazing lands and native feed resources such as free range grazing. There is little or no conserved feed at all. Farmers also feed their animals on crop residues either at home or right in the fields, particularly during the dry season. The study showed that water for livestock was mainly found in the seasonal rivers, ponds and wells. The large ruminants (cattle) had access to water once in two days while the small ruminants could afford to drink once a day. Animals had to walk long distances to water during the dry seasons.

Pasture and land management practices were scanty as animals grazed on unfenced pastures. There was very limited bush clearing and grazing management as most respondents practised no known grazing strategy following the privatization of land ownership. It

was evident from the study that, farmers ran out of feed some time in the year and had either to lease or beg some grazing from their relatives or neighbours.

Main economic animal management practice was disease control which included vaccinations, hand spraying and dipping. Sick animals were treated by the veterinary department staff, although very few farmers reported visits by the veterinary officer to their villages. Farmers reported most animal deaths to correspond with the wet season (rains), although most animals were treated for diseases during the dry season as shown in Table 2 below.

Table 2: Death of various livestock types in relation to time/season of the year and drought as reported by farmers in Kibwezi Division.

Type of Animal	Time of year		
	Wet season	Dry season	Drought
Cattle	+ + +	+	+
Sheep	+ + +	+ +	+
Goats	+ + +	+	+ +
Donkeys	+ + +	+ +	+
Chicken	+ + +	+	+

Key:

+ + + - **Very high**
+ + - **High**
+ - Low

Farmers' reactions to drought included selling of livestock. Drought is here perceived as catastrophe related to famine. Based on the data obtained relating to livestock ownership and land allocation, the land was overstocked and there was seasonal feed shortage. The overstocking was also reflected by signs of soil erosion and environmental degradation as reported by over 60% of the farmers interviewed. The farmers felt that the main constraint to livestock was shortage of feed and water and, that breed types were no limitations to production.

Analysis of the Merits of Crop-Livestock Production Systems

Cultural background coupled with external forces such as rapid population and expansion made the small holder a victim of many vagaries in ASAL regions. Many of the farmers favoured crop production due to ease of production and short period of maturity of the saleable product. This is a deviation from the known traditional Wakamba who are agro-pastoralists raising both crops and animals in a broad-based socio-cultural and socio-ecological systems capable of challenging the natural catastrophes.

The data collected by the authors was subjected to economic analysis to determine technical and economic efficiencies. These efficiencies are exemplified in Figure 5. Technical efficiency based on the frontier approach proposed by Fare et. al. (1985) is measured as a ratio of realized output to the potential output which may or may not be realized, i.e., TE = Ob/Oc. Economic efficiency is the ability to choose those quantities of inputs (labour and capital) that maximize net revenue function given the market conditions of factor supply and product demand i.e. EC =QA/Qb (Russel and

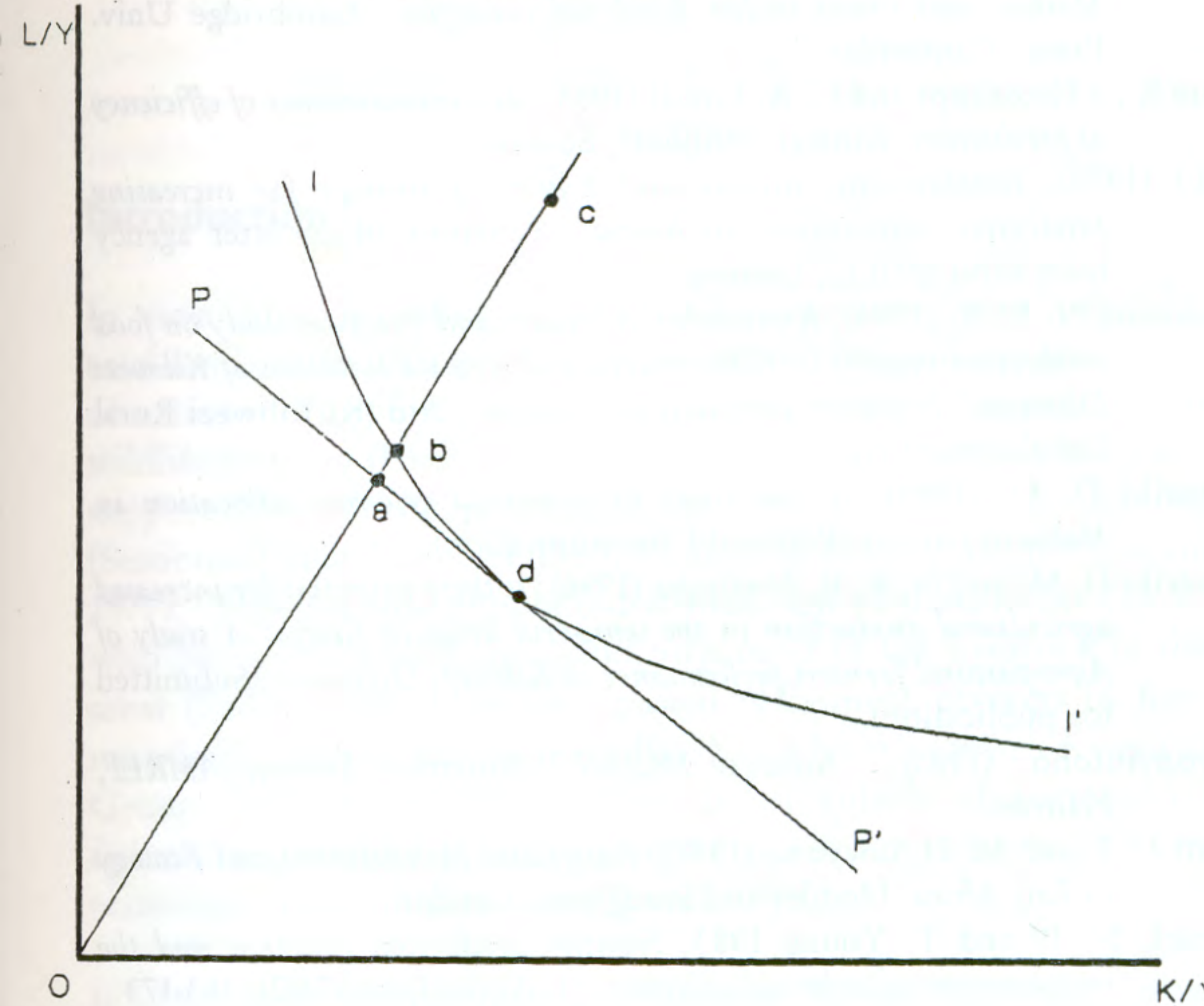
Young, 1983; Collins and Young, 1989). The data employed physical units rather than monetary values. The inputs used were land in hectares, labour in man days, seed in Kg, fertilizer in Kg and livestock in units. Livestock units are important not only as sources of meat, milk and cash but also as manure and draught power. Livestock output is therefore converted to maize equivalent.

- It was found out that, during the short rains (October - December), farmers performance was better in terms of technical and economic efficiency than during the long rains. Fertilization seemed to increase the efficiency in both models.

  Of special significance was the fact that farmers with both livestock and crops composed the bulk of the most efficient farmers and employed complementarity. Generally those farms with maize - pigeon pea - livestock mix tended to have higher efficiency than those without pigeon pea and/or livestock as part of their production. In addition, one farm which was found to be extremely efficient (100%) in all seasons and declared outlier had access to irrigation water. This is as expected since extra source of water in semi-arid areas will improve efficiency of farm production.

Fig. 5. Best practice frontier approach for efficiency determination

Note: Farm d is both technically and economically efficient because it is on both Isocost/Isoquant frontier.
c is both technically and economically inefficient
a is economically efficient
b is technically efficient



References

Collins D. and T. Young (1989). *Principles of Agricultural Economies. Markets and Prices in less developed countries.* Cambridge Univ. Press. Cambridge.

Fare R., S Grosskopt and C. A. Lovell (1985). *The measurement of efficiency of production.* Kluwer - Niljhoff, Boston.

ILO (1972). *Employment, Income and Equity: a strategy for increasing productive employment in Kenya.* A report of an inter agency team UNDP/ILO, Geneva.

Musimba N. K. R. (1994). *Knowledge, Attitudes and Practices study on food production systems in Kikumbulyu and Ngwata locations of Kibwezi Division.* A report prepared for Action - Aid (K) Kibwezi Rural Development Area.

Nyariki D. M. (1993). *A case study of household resources allocation in Makueni District* (Personal Communication).

Nyariki D. M. and N. K. R. Musimba (1996). *Is there potential for increased agricultural production in the semi-arid areas in Kenya? A study of Agro-pastoral farmers performance in Kibwezi Division.* (Submitted for publication).

Nyonyintono, (1985). *Kibwezi MCH/FP Nutrition Survey, AMREF,* Nairobi.

Pratt D. J. and M. D. Gwynne (1977). *Rangeland Management and Ecology in East Africa.* Hodder and Stoughton, London.

Russel, N. P. and T. Young 1983. *Frontier production function and the measurement of technical efficiency.* J. Agric. Econ. 34(2). 163-173.

3. Paradigmatic Shifts in Rangeland Management of African Savannahs: Implications for Pastoral Development. A Case of Northeastern Kenya

Kassim O. Farah[*]

Introduction

In most African countries, rangelands constitute two-thirds of the total land, but with a population of about 25%, and yet are a source of national economic livelihood in terms of livestock industry and wildlife tourism (Farah 1997). These lands form 80% of Kenya and support 25% of the population, as well as 50% of its livestock (Sessional Paper No. 1 of 1986, Pratt et al 1977, Pratt and Gwynne 1977). Most of this population is made up of pastoralists (14.5%), who occupy 67% of Kenya, and own most of the livestock in these areas (Farah 1997). However, past development projects in Kenya rangelands such as the Grazing Blocks of North-eastern Kenya and Group Ranches of South ranges are singularly characterised by failure due to faulty project promises and assumptions in the socio-economic and ecological sense (Farah 1996).

It is apparent from past performance on Kenya rangeland projects that national policy and development planning regarding them and indeed much of sub-saharan Africa has been less than sound, especially given that the policy was based on the mainstream range management view. This school of thought stipulates that African arid pastoral ecosystems are essentially equilibrium in nature. It

* Department of Range Management, University of Nairobi

advocates management prescriptions that are totally at variance with sound and sustainable development of pastoral production systems in African arid lands (Farah 1994, 1996).

The technical basis of rangeland development policy, therefore, requires a thorough appraisal so as to properly reflect problems, perceptions and aspirations of their inhabitants. Development planning and successful execution of specific development programs are thus to a large extent dependent on an appropriate policy framework.

Management and Development of Rangelands in Kenya: A case of North East Kenya

Management and development of rangelands in N. E. Kenya can be classified into three distinct phases: the colonial period; early post-independence period; and the present period (Farah 1994, 1996).

The Colonial Period

The colonial government felt that the greatest challenge in North Kenya was to make the nomads amenable to governance. This was to be achieved through the implementation of the territoriality concept, using **Special District Law Ordinance of 1934.** This empowered the Provincial Commissioner of Northern Frontier District (NFD) to define grazing and water boundaries for different ethnic and sub-ethnic groups in an attempt to avoid armed conflict; trespassers were punished through arbitrary stock fines (Farah 1996).

This concept of territoriality, according to Farah (1994) had three negative consequences for northern pastoralists. These were:- assuming clan territoriality could be discerned; limiting the ability of nomadic pastoralists, whose production system is based on flexibility in resource utilization to meet their needs; fixing boundaries and control of the movement of pastoralists undermined mutually beneficial interactions between them and cultivators.

Livestock development by the colonial government was based on development plans prepared for the semi-arid lands (rainfall of 600-800mm per year) - e.g. the ALDEV plan (1946 - 1955) and Swynnerton plan (1954). Their main thrust centered on management of rangelands and development of livestock covered areas such as: (i) adherence to wet season/dry season utilization of range resources within clan territories; (ii) veterinary services provision; (iii) water development; and (iv) livestock marketing, which was overseen by the Livestock Marketing Division (LMD) established in 1963 (Farah 1996).

The colonial government's livestock policy lacked goodwill and activities were maintained at marginal levels. Furthermore, these development efforts were piecemeal in nature (Farah 1994).

Early Post-independence Period

At the dawn of independence, the already perilous state of Kenya rangelands was exacerbated by the floods of 1961/1962 to such an extent that the colonial government decided to create the Range Management Division under the Ministry of Agriculture and Animal Husbandry (Farah 1996). The range management division

was specifically mandated to deal with the rehabilitation and development of rangelands in Kenya so that they could contribute significantly to the national economy. Between 1963 and 1969 the post - independence Kenyan government became so pre-occupied with the Shifta war that all sectoral development in the region was reduced to a bare minimum.

A national rangeland development programme was prepared (Pratt 1968) which included proposals for Northern Kenya. This culminated in the establishment of the Grazing Blocks Development Project, which lasted for ten years, 1969 to 1978. The reasons underlying the proposals were that: (1) no region should be completely deprived of development finance while others benefited; (2) the development of ranching enterprises elsewhere in the semi-arid areas required transfer of cattle from Northern Kenya; and (3) the survival of the northern arid zones depended on an annual increment of livestock offtake.

Two observations should be made about the above reasons advanced as the basis for developing these rangelands. First, it is wrongly assumed that the goal of the northern nomads is production of beef cattle. Second, pastoralism is portrayed as an inherently destructive land management practice needing external intervention (Farah 1994, 1996).

Pratt (1968) recommended that livestock production among the nomads be developed along an essentially western beef ranch model. Creation of grazing blocks was like trying to form super ranches which could afford greater managerial control. Yet the non-equilibrium pastoral ecosystems of North-eastern Kenya are best

managed through greater flexibility rather than rigidity (Farah 1994).

The Grazing Block Development project was designed to provide services and assistance to pastoral communities along multisectoral lines, including water development, livestock marketing, veterinary services and purposefully structured grazing management with a great degree of control. However, before the effects of the flaws in the technical inputs of the project could express themselves, success was hampered by the approach and mode of project implementation (Farah, 1996).

Present Status of Rangeland Development in Kenya

Rangelands development efforts prior to 1979 was mainly donor-induced by international development and funding agencies (e.g. USAID and World Bank). Between 1963 - 1978, the main thrust of government development effort was directed at the high potential lands that comprise 20% of Kenya's area, which are presently over populated. The government re-oriented its development policy to afford greater focus on the so-called Arid and Semi - arid Lands (ASALs). In 1979 a national ASAL program was formed under the Ministry of Planning and National Development to specifically address development problems in ASALs.

This shift in government policy was further focused and articulated in Sessional Paper No. 1 of 1986. It has also been reiterated in the various Government National Development Plan's since then. In 1989, the government's commitment to development of ASAL areas was further strengthened by the formation of the Ministry of

Reclamation and Development of Semi-Arid, Arid and Wastelands, whose sole responsibility was to specify, quantify and remedy environmental and production problems of ASALs. While all this metamorphosis was laudable, timely and prudent, there were some serious shortcomings particularly as regards the management and development of arid lands. In general, the policies were based on the mainstream, conventional view of range management, which is totally inappropriate for African pastoral ecosystems. Moreover, as in Pratt's (1968) development proposals, the bias veered towards cattle production, forgetting that ASALs supported all the camels in Kenya. Associated with the acronym ASAL is the risk of semi-arid lands "swallowing up" arid lands when it comes to prioritizing development activities.

Conclusions and Recommendations for Improved Rangelands Management

It is almost unanimously agreed that the projects contracted in western metropolises and without participation of the intended beneficiary communities are causing untold human, environmental and ecological disasters (Farah 1997). For example, the haphazard implementation of group ranches and grazing blocks in Kenya's policy has led to the "ecological crisis" and expropriation of communal land rights leading to heightened political sensitivity and loss of economic stability among the pastoralists.

In Kenya, the nagging issue is how to amalgamate "indigenous knowledge" into pastoral development programmes. Past development initiatives have blundered by disregarding the "role and significance of indigenous technical knowledge in natural

resource management" with the result that "projects in ASALs are characterised by failure due to faulty project premises."

Such failures lead to questions about the role of development intervention organizations in pastoral communities. Lack of appreciation of and information on resource patterns in pastoral areas is one reason for the ineffective and abandoned projects which are initially meant to help pastoral people. The failure has been due to lack of clear developmental policies, as well as research and information to guide project implementation during the interventions.

Future formulation of better policies for the development of rangelands in Kenya must take into consideration some fundamental factors that have been ignored in past and present national policies.

1. The production goals of the pastoralist must be properly understood and appreciated. These largely revolve around dairy and contingency meat production attained by keeping livestock comprising of multiple herd species, with ecological and socio-economic adaptive values. Any future policy for developing rangelands must, therefore, recognize and take cognizance of the operational, ecological and socio-economic forces that underlie survival strategies of pastoralists who utilize them. Efforts should be geared towards sustainable pastoral production systems.

2. The assumption that nomadic pastoralism has no future unless transformed into commercial beef production systems is invalid and should therefore be ignored.
3. Rangeland ecosystems in Africa have shifted from equilibria to non-equilibria. Hence, future rangelands policy for improved livestock production should be based on flexible utilization of highly variable range resources instead of measures which enhance managerial control and rigidity of production system such as the Grazing Blocks which were essentially super ranches.
4. Rangelands should be managed for their adaptability rather than stability, a fact that constitutes the most serious shortcomings in the current ASAL policy.
5. A viable rangeland policy must come up with a precise and fair framework on which land tenure and issues relating to property rights can be based, accompanied by appropriate and effective legislative back up.

Development interventions for sustainable production in Kenya's rangelands best conceptualized on a sectoral basis and most likely to be successfully implemented in a ,multisectoral and holistic framework include:- (i) research, training and extension; (ii) land tenure; (iii) water development; (iv) livestock marketing; (v) animal health and veterinary services; (vi) alternative investment to livestock; and (vii) drought management.

References

Farah K. O. (1997). *Pastoral land policy under fire.* DN/A Monday, January 20, 1997: Kibisu Kabatesi (ed.).

_____. (1996). *Management and Development of the Arid Communal Rangelands in North- Eastern Kenya: a Critical Analysis of the Past and the Present. The African Pastoral Forum*: Working Paper Series No. 7 June 1996.

_____. (1994). *The Communal Rangelands of North East Kenya. a paper presented in a Symposium for the Sustainable Development for North East Kenya*; Isiolo, Kenya 1994: Abdi Umar (ed.).

GOK. (1986). Sessional Paper No. 1 of 1986. *Economic management for renewed growth*. Government printer, Nairobi.

Pratt, D. J. and M. D. Gwynne, (1977). Range Management and Ecology in East Africa. Hodder, New York, U.S.A.

Pratt, D. J., P. J. Greenway and M. D. Gwynne, (1977). *A classification of East African Rangeland.* J. Appl. Ecol. 3:339-384.

Pratt, D. J. (1968). *Rangeland Development in Kenya*, Jodhpur India. The Arid Zones Research Association of India.

4. SUMMARY OF SUPPORTIVE PAPERS

Ruminants and Range Management, Major Thrusts and Extension Activities in Kibwezi

P. Kaguthi

This paper presents Ruminants and Range Management Practices under Breeding, Management, Housing, Culling and Record-keeping activities.

Sheep breeds kept are the Red Masai and Black Head Persian, while goat breeds are small East African goats and some Gallas. The main cattle breed is the small East African Zebu which is not native to the region; hence it is affected mostly by drought and diseases. However, Sahiwals, Borans, exotic breeds and their crosses are kept but to a lesser extent.

The author discusses various management practices which include: grazing and pasture management, routine flock management, disease control and treatment, and breeding flock management for both shoats and cattle.

Shoats are grazed together with cattle and donkeys and no definite pasture management is involved. Grazing individually or in herds using a common herder is done. Free cattle grazing is practised and focus is on bush clearing and fodder production. Supplementation with maize stalk hay is also common. However, enclosures or paddocking are not common.

Routine flock management involves deworming and hoof trimming for shoats and in addition dipping for cattle. Disease control and treatment emphasis is on Contagious Caprine Pleuro - pneumonia, worms and diarrhoea for shoats and trypanosomiasis for cattle.

Free inbreeding is done without any proper management for all types of livestock. No specialized types of housing for both shoats and cattle are provided and night bomas are common. Culling is done depending on needs and record-keeping is not common.

Livestock Extension Situation in Kibwezi Division

Gachuhi Johnson

Kibwezi has a land size of 2208 Km^2 with a population of 143,740 persons. It has 6 locations and 31 sub-locations. Staff farmer ratio and staff livestock ratio are 1:2178 and 1:35935, respectively.
In this paper, the author discusses the extension structure and units, extension methods and problems present in Kibwezi. The various extension methods in use include:- training and visit (TV) using frontline staff, demonstrations at contact points using contact farmers or contact groups, workshops and supervision of frontline staff.

Major livestock extension problems in Kibwezi includes: lack of enough frontline staff with adequate knowledge on livestock production, lack of transport, lack of funds, poor dissemination of information to farmers, inadequate demonstration materials and poor supervision due to lack of transport.

Factors Affecting Honey Production in South Kenya Rangelands: A Case Study of Kibwezi Division, Makueni District

E.M. Mutungi, Nashon K.R. Musimba and Kassim, O. Farah

Beekeeping enterprises can be practised with the highest potential in dry areas where crop farming is not possible and livestock rearing does not directly compete with beekeeping. Four essentials are required for successful beekeeping: (i) climate and plant conditions that lead to nectar and pollen resources; (ii) well-adapted, industrious and manageable bees; (iii) familiarity and skill of the population in the management of colonies; (iv) sufficient market opportunities for the main bee products, honey and wax. Honey production can provide employment, food and the much needed foreign exchange when exported.

The authors present the factors which affect honey production in the region as lack of forage; competition between beekeeping and other agricultural activities; cutting of trees and shrubs for construction, fencing and charcoal burning; scarcity of young beekeepers; lack of protective clothing; lack of modern beekeeping equipment; difficulty in assessing the best time to harvest honey; swarming; difficulty in obtaining wire for hanging hive out of reach of honey badgers; destruction of bee forage by caterpillar attack; human vandalism; other predators like birds, tree squirrels, snakes, and ants; poisoning of bees by insecticides and pesticides; bee diseases and bush fires; scarcity of appropriate containers; poor

marketing systems; density of colonies per acre; and climatic factors.

Honeybee races of the region are presented as Apis mellifera litorea, A.m. scutellata and Apis m. monticola dominance in that order. Honey flow resources, technical bee management knowledge of the Wakamba and various uses of hive products are discussed in detail. Recommendations and interventions for increasing honey production are also presented.

Poultry Production and Improvement in Kibwezi

Gachuhi Johnson

Chicken production is the most important livestock enterprise in Kibwezi. Statistics has it that about 250,000 and 2000 local and commercial birds are found, respectively, in the region.

The objectives were to improve meat and egg production so as to provide more animal proteins and income to farmers.

Major activities were: training of farmers on better poultry management and exchange of cockles/pullets to improve the flock. Training was done through farm visits, field days, barazas, demonstrations and farmers seminars.

Gachuhi presents the major problems faced in poultry production and improvement as: low management skills, diseases and parasites,

unavailability of improved breeding stock and lack of commercial feeds for commercial birds.

Other poultry kept but in small numbers are: ducks, turkeys, ostrich and geese.