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RESERVE

THE EFFECTS OF INCREASED CROP PRODUCTION ON
LIVESTOCK INVESTMENTS IN A SEMI-ARID AREA:
SOME EXAMPLES FROM BARINGO DISTRICT, KENYA.

By

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The Effects of Increased Crop Production on Livestock Investments in a
Semi-Arid Area : Some Examples from Baringo District, Kenya

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Abstract

The paper addresses the major premise of the arid and semi-arid lands (ASAL) program in Kenya which states that increased crop production in the semi-arid areas will lead to a reduction in livestock numbers since dependence on livestock for subsistence needs will be reduced. Theoretical support for this position derives from a "school of thought" in pastoral studies which posits that indigenous livestock production systems in Eastern Africa are maintained mainly for the purpose of supplying a steady source of food (i.e., pastoral products) for the pastoral population. Evidence from Njemps Location, Baringo District suggests that while increased crop production has substituted grain for pastoral products in the diet, it has not undermined the role of livestock as a form of investment. It is further argued that a focus on "statistical" averages in livestock holdings, rather than the range and variation in property ownership, informs development planners little about which group or groups of livestock owners will respond to increased opportunities for agriculture. Capital and labour requirements for irrigated agriculture in Njemps are such that the wealthier livestock owners are the individuals which are most capable of taking advantage of crop production opportunities. The dilemma in Njemps Location arises due to the fact that groups of livestock owners are responding to irrigated agriculture for different reasons: the rich pastoralists are investing in agriculture as a mechanism for supporting their livestock holdings, while the poorer families are being forced into agriculture out of necessity to meet subsistence needs and these latter households have only a minimal impact on the livestock sector. Because of this second group of households it is argued that crop production, especially low cost methods of dryland farming, should be encouraged in Njemps Location, but should not be perceived as a mechanism for supporting range management programs.

INTRODUCTION

A commonly held belief among policy planners and development specialists in regard to the development of Kenya's arid and semi-arid lands (ASAL) is that an increase in food crop production in these areas will lead to a reduction in livestock numbers (cf. Republic of Kenya, 1978; Ottley, Wanjaiya and Martin, 1978). This premise, in fact, forms the basis for Kenya's present development efforts in the arid and semi-arid lands and it is believed that through increased crop production, soil conservation and livestock development needs will be served because grains will be substituted for pastoral products in the diet and thus livestock numbers reduced. To quote one source (Republic of Kenya, 1980: 124): "The food crop development relates closely with livestock development in that when a farmer has sufficient food, his reliance on livestock is reduced hence indirect destocking." Increased food production in the semi-arid areas, then, is viewed as an important mechanism for solving the major perceived development obstacle in the pastoral areas, inadequate resource management practices often characterized by overgrazing and range degradation.

This particular perspective emphasizing the subsistence aspect of indigenous livestock derives theoretical support from numerous scholars which argue that Eastern African pastoralism is a system which functions mainly to insure adequate food production for human consumption. Some very valuable works have resulted from this "school of thought", most noteworthy is Dahl and Hjort's (1976) book which represents the most ambitious work to date on African livestock production. Another is Brown's (1971) article relating human diet requirements to pastoral herd sizes. In the latter work, the author simulates minimum cattle herd sizes necessary to keep a pastoral population alive on a diet of varying proportions of milk and meat. Both of these works, as well as others (cf. Pratt and Gwynne, 1977), emphasize only one of the two roles of indigenous livestock in Kenya; that is, the food commodity aspect of livestock. Another, and in some areas of Kenya, more important dimension of livestock is that as a form of investment or capital (cf. Schneider, 1981). In this respect, investing in livestock is often achieved at low costs and earns "interest" in the form of reproduction (calves or kids). As Dahl (1979: 54) points out in a more recent work, the two dimensions of indigenous livestock are not contradictory in that both aspects emphasize reproduction and hence herd structures which are biased toward adult females. The degree to which

either dimension of livestock dominates the other depends partially on the extent to which the pastoral population can be food self-sufficient on pastoral products alone. In areas where agricultural markets are readily accessible and alternative foodstuffs have become an important part of the pastoralists' diet, livestock's role as a food commodity will be minimized. The capital aspect of livestock, in turn, will be less important in regions of Kenya where distribution networks of alternative foodstuffs are less developed and pastoral populations thus are compelled to be more self-sufficient. In the latter case, such areas would include the Northeast and parts of Turkana District. It would also be expected in these areas that full utilization of pastoral products such as blood, sour milk and ghee would be greater than in regions where market integration is more advanced. This is well illustrated in Baringo District where the Il Chamus (Njemps) that have greater access to grain markets do not as fully utilize ghee and animal bleeding potential as those Il Chamus residing in the more remote areas where grain distribution networks are less developed. As will be discussed in the paper, it is actually the former group of Il Chamus which are the wealthier livestock owners and consequently more capable of subsisting only on pastoral products. Whether any pastoral groups in Kenya were able to ever subsist throughout the year on pastoral products alone is questionable. Nevertheless, the present trend in most arid and semi-arid areas of Kenya is toward an increasing diversification of the local diet.

In regard to Kenya's current development efforts in the ASAL, a program which encourages the substitution of grains for pastoral products in the diet through increased production of food crops confronts only the food commodity aspect of livestock and does not undermine its role as a form of investment. In areas where livestock is often sold in order to purchase grain, crop production may actually support the buildup of livestock since it will reduce cash demands at the household level. Moreover, if land for crop production does not directly compete with land for pastoral use and if livestock are grazed on harvested fields, then crop production may further enhance the livestock sector by increasing available animal fodder.

The present paper examines the impact of increased crop production on livestock holdings in a semi-arid area of Kenya. More specifically, it focuses on the Il Chamus area (Njemps Location) of Baringo District, a region which is currently receiving substantial development inputs. It is argued in the paper that distinctions between agriculturalists and

pastoralists on the agricultural sector and the pastoral sector which are frequently made in the literature often mislead people into believing that crop production in pastoral areas will only attract poor stockowners. Movements from the pastoral sector to the agricultural sector are usually described as being limited to the poor stockowners, especially those who have recently lost their herds. Such transformations to agriculture are often perceived as a mechanism for helping the destitute stockowner to build up sufficient surplus in order to reinvest it into the pastoral sector. That shifts of this type may also be a strategy among wealthier stockowners as a means for supporting their present livestock holdings is not usually considered. In addition, there has also been a tendency in studies of pastoral and semi-pastoral areas to focus on "statistical averages", rather than the variation and range in livestock holdings which is far more valuable information in regard to development planning. The failure to recognize the great disparity in livestock ownership in pastoral areas has led some scholars to overemphasize the egalitarian nature of pastoral societies which in the political sense may be true, but in relation to equal access to property is not the case.¹

The findings and suggestions presented in this paper are not assumed to be applicable to all other semi-arid areas of Kenya. In fact, relative to other pastoral² areas of Kenya Njemps is unique in a number of different ways. The Il Chamus area of Baringo District, for example, has always had more crop production than most other pastoral areas and also has greater

1. The fact that opportunities for economic advancement ("rags to riches" syndrome) are available in livestock areas relates, in part, to the egalitarian political structures of these societies (cf. Schneider, 1980). Such social mobility in these systems is becoming increasingly restricted.

2. The term pastoral in this context refers to a system where livestock production is the predominant source of income or livelihood for the majority of people. Finer distinctions can easily be made, and a term such as agro-pastoral or semi-pastoral may more accurately define contemporary Il Chamus economy where approximately one-third of the families now have access to farms. However, as will be discussed later in the paper, most of the renewed interest in agriculture has occurred in the past fifteen years.

irrigated agriculture potential than most semi-arid regions of Kenya. For this reason, as well as the fact that the area lies in close proximity to high potential agricultural regions and markets, grain has always been an important part of the Il Chamus diet, especially in regard to the dry season. In addition, Njemps is somewhat unique in that the pastoral economy revolves around a highly productive seasonal swamp area of approximately twenty square kilometers. This dry season grazing area circumvents the shores of Lake Baringo and extends from the Perkerra-Molo basin south of Lake Baringo to an area approximately two kilometers north of Lake Bogorio. The presence of this large swamp allows the Il Chamus, in most parts of Njemps Location, to be relatively sedentary; perennial water sources such as the Perkerra River and Lake Baringo means that stock watering distances in the dry season in most areas of Njemps do not exceed seven kilometers. Nevertheless, that Njemps Location represents a region where crop production has increased considerably in the past fifteen years may provide some lessons and guidelines for other semi-arid areas of Kenya where development assistance in agriculture is planned.

The data presented in this paper are drawn from eighteen months of fieldwork conducted mainly in the Ngambo, Salabani and Eldume sub-locations of Njemps.³ Two sample sets of twenty-eight randomly selected households were monitored for labour use, consumption, cash expenditures, production and marketing for periods of seven months in both 1980 and 1981. Households represented areas where crop production is a recent phenomenon and regions where it has a relatively long history (over twenty years).⁴ Numerous surveys concerning such topics as residence histories and kinship organization were also conducted in these three sub-locations as well as the other sub-locations of Njemps, Mukutani and Loininange. In addition, marketing surveys were carried out in the Tugen areas of Ravine Division (south Baringo) and in Lobo, Chapchap, Ewalel and Saimo Locations of Marigat and Kabartonjo Divisions. This was done to determine the amount of food commodity trade between these more agricultural regions and Njemps Location. Sample sizes in the extensive surveys were often over 100 households and in some cases as large as 250 households. Much of the information

3. This study was funded by a doctoral fellowship from the Social Science Research Council, USA. Their support is gratefully acknowledged. The views expressed in the paper are those of the author and do not reflect the views of the funding institution.

4. Until the beginning of the twentieth century, the Il Chamus were predominantly agriculturalists due mainly to the fact that frequent stock raiding by larger groups such as the Turkana at the time made pastoralism very hazardous. Shifts to cultivation here refer only to the last century.

on such important issues as land tenure and family cooperation in agriculture could not be obtained through questionnaires. Thus, the researcher often relied for data collection on what the anthropologists call the "participant-observation" method.

The following paper is organized around the theme of increased crop production in Njemps Location and three main issues will be addressed. These are:

- 1) The economic, ecological and demographic pressures which have resulted in the past fifteen years in a greater incorporation of grain production in Njemps.
- 2) The question of who has taken most advantage of the increased opportunities for cultivation, especially irrigated agriculture: the rich or the poor stockowners, the young or the old household heads.
- 3) What are the implications of increased crop production for rural development in Baringo District.

Background information will be presented in the paper on demography, livestock and grain marketing, household expenditures, costs of crop production and other topics which are critical to an understanding of the broader issues outlined above.

1. General Ecology and Demography of Njemps Location

The Maa-speaking Il Chamus reside in Kenya's Baringo-Bogorio basin and in the hill region extending east of Lake Baringo to the Laikipia escarpment. Administratively, they occupy most of Njemps Location, Baringo District, an area of approximately 600 square kilometers. The Il Chamus homeland is located in Kenya's central Rift Valley and altitude in the region ranges from approximately 3100 to 4500 feet. The ecology of the area is characterized by brush Acacia, especially species of Acacia reficiens, Acacia nelliifera, Acacia senegal and Acacia tortillas (UNDP, 1967). In some of the lowland areas ("flats"), severe gully erosion has occurred and grass cover is sparse (not including the swamp areas) throughout the year. Common annual grasses found in this region are Eragrostis spp., and Tetrapogon spathecus and forbs such as Heliotropium spp. (highly unpalatable) and Portulaca spp. are becoming increasingly dominant as a percentage of total ground cover. The only region in the "flats" area where perennial grasses are found is in the seasonal swamps. Dominant grass species there are Cynodon dactylon, Cynodon plectostachyus, Echinochloa haplocada and Digitaria velutina.

Average annual rainfall at Marigat (based on the past sixteen years) is 640 mm. and is unimodally distributed with the largest concentration of annual rainfall falling in the April-August months. Monthly rainfall statistics, however, are misleading in that in any given month rainfall is often concentrated in only a few days of the month. Rainfall patterns in Baringo District are highly localized and monthly variations in any given year may differ considerably from the statistical norm. In Marigat, for example, nine out of the twelve months of the year have been leading rainfall months in at least one of the past sixteen years.

Based on Kenya's 1979 population census, the Il Chamus population is 6800 and the population of Njemps Location is 8642. The twenty-one percent of non-Il Chamus who live in Njemps Location are mainly Tugen. Il Chamus population increased more than three-hundred percent from 1929 to 1979, an annual increase of approximately two percent (Colony and Protectorate of Kenya, 1930: 16). This was due to a large extent to the incorporation of Tugens as they moved out of the Tugen Hills at the beginning of this century. This process seems to have slowed considerably in the past ten years. From 1969 to 1979, the Il Chamus population only increased from 5933 to 6800, an annual growth rate of less than one percent. This period correlates with a time that more Il Chamus went outside of the District seeking employment and at census time may have been identified as Maasai or Samburu. Approximately, 300 Il Chamus are presently employed as unskilled farm labourers outside of the District. The majority of these are working on farms or ranches in Laikipia and Nakuru Districts.

Within Njemps Location, regional population densities vary considerably according to economic and ecological criteria. Human population and population densities are presented in Table 1. for each of the five sub-locations of Njemps. Note is also made of the percentage increase in population for each of the sub-locations since the 1962 census.

Table 1. Human Population, Njemps Location

<u>Sub-Location</u>	<u>1979 Population</u>	<u>% Increase Since 1962</u>	<u>1979 Pop. per square km.</u>
Ngambo	3116	101%	66
Loininange	1519	62%	8
Eldune	810	57%	19
Mukutani	1708	46%	8
Salabani	<u>1789</u>	<u>31%</u>	<u>50</u>
	8642	56%	16

* Based on 1962 and 1979 population censuses.

The largest population concentration and greatest increase in human population in the past eighteen years has been in Ngambo sub-location. Of all sub-locations in Njenps, population has always been highest in Ngambo mainly because of its easy accessibility to swamp grazing. More than forty percent of the twenty square kilometers of swamp in Njenps is located in Ngambo sub-location. This includes most of the Molo-Perkerra basin swamp, the main dry season grazing area for the Il Chamus. Moreover, water is also readily available throughout the year in the Ngambo region and distances to water sources in the dry season never exceed four kilometers. Factors accounting for the relatively recent growth (1962-1979) in population in Ngambo are related to the influence of the Perkerra Irrigation Scheme and the beginning of small-scale irrigated agriculture in the area. Families which have been forced out of the pastoral sector due to livestock losses and do not have the necessary resources to engage in agriculture themselves have settled in the Ngambo area in order to engage in wage labour on the nearby Perkerra Irrigation Scheme. Other families moved to the Ngambo region in the past ten to twelve years because of the initiation of a small-scale, indigenous irrigation scheme which was started in 1963 and began to operate on a large scale in the late 1960s. This latter scheme was begun under local initiative and irrigates from the excess, runoff water of the Perkerra Irrigation Scheme. Of all the Il Chamus areas, probability of adequate water for irrigated agriculture in any given year is highest in Ngambo.

2. The Livestock Dimension of Il Chamus Economy

2.1 Herd Sizes, Herd Structures and Herd Ownership

Cattle numbers in Njenps were greatly reduced during the 1979-1980 drought. Estimates based both on hides and skins sales records for the drought period and interviews with individual livestock owners indicate that the Il Chamus lost approximately sixty percent of their cattle. The majority of cattle mortalities occurred in the last quarter of 1979. All sub-locations of Njenps except Eldume, lost at least fifty percent of their cattle. Regional variations in herd depletion ranged from forty percent to seventy percent of total herds. Causes for cattle mortalities were usually related to one of two factors, East Coast Fever or drought (lack of grazing), the more important of the two varying in different areas. In Mukutani sub-location, for example, the main cause of cattle mortalities identified by the local people was East Coast Fever (ECF). This was followed in order of importance by trypanosomiasis and lack of grazing. In Ngambo sub-location, on the other hand, the main cause of cattle deaths was said to be lack of grazing; ECF was identified as the main reason for mortalities by only twenty-

four percent of the informants. It should be remembered that it is sometimes very difficult to analytically distinguish between drought and disease as separate causes of cattle deaths when in fact in a drought year they are often closely related. That is to say, poor nutrition will exaggerate an animal's susceptibility to disease and there will be a significantly higher mortality rate if grazing is inadequate.⁵ In total, causes of cattle mortalities identified by Il Chamus stockowners indicate that forty-nine percent of stock deaths in the 1979-1980 period were related to East Coast Fever, while forty percent were caused by lack of grazing and a further eleven percent were predominantly a result of Trypanosomiasis and other stock diseases.

Present herd composition and structures in Njenps reflect the recent occurrence of drought and stock disease outbreaks in the region. In the sample areas of Eldume, Salabani and Ngambo sub-locations, average herd sizes per family of seven (n= 71) are nineteen cattle, twenty-nine goats and seventy-three sheep. Standard deviations for all stock categories are very high, e.g., twenty-six for cattle, thirty-six for goats and one hundred and eighty-five for sheep, and indicate a highly distorted distribution pattern. Of the three sub-locations, the largest average cattle herds are found in Ngambo with an average of twenty-one cattle per average sized family (seven members), while the largest average sheep holdings, 109 per family, are in Salabani sub-location.⁶ The high proportion of sheep in herd compositions are indicative of the recent drought and stock disease outbreak which only affected sheep minimally. An estimated thirty-five percent of total goats, however, died during 1979 due to an outbreak of Contagious Caprine Pleuropneumonia (CCPP). The large numbers of small stock presently in Njenps may also be a function of a common post-drought strategy for rebuilding herds among the Il Chamus; that is, investing in small stock initially because of their fast rate of reproduction and then selling them and buying cattle or exchanging the small stock directly for heifers or young bulls.

5. Periodic depletion of herds on a large-scale are not unusual in Njenps and in each of the 1960, 1965 and 1973 droughts an estimated thirty to thirty-five percent of total cattle were lost.

6. In addition to the factors discussed above, average stockholdings in the Il Chamus area are low because of the fact that many very poor households (in terms of livestock) are able to remain in the area due to the opportunities either to engage in wage employment at the Perkerra Scheme or to work on the large irrigated farms of the wealthy stockowners. The presence of these families greatly reduces the average livestock holding figure.

Present herd structures for Il Chamus cattle are also indicative of the 1979 livestock disasters in Njemps. This is especially in regard to the low percentage of adult cows represented in Il Chamus herds. These were the animals most affected by the drought and disease outbreaks. Table 2. depicts present herd structures for Il Chamus cattle, sheep and goats. It should be noted that castrated goats and sheep were not distinguished from other male natures because of the difficulties in dealing with the large flocks of small stock in Njemps. The two flocks which I did identify revealed that seventy percent of male mature sheep and goats were castrates,

Table 2. Herd Structures, Njemps Location

<u>Cattle (n = 2563)</u>					
<u>%Calves (up to 1 year)</u>	<u>%Immature Bulls</u>	<u>%Mature Bulls</u>	<u>%Ox</u>	<u>%Heifers</u>	<u>%Cows</u>
17%	10%	4%	7%	29%	33%
<u>Sheep (n = 4513)</u>					
<u>% Kids (up to 8 months)</u>	<u>%Rams</u>			<u>%Ewes</u>	
21%	13%			61%	
<u>Goats (n = 1673)</u>					
<u>Kids (" " ")</u>	<u>He-goats</u>			<u>She-goats</u>	
29%	22%			49%	

The cattle herd structure in Table 2. is similar, with the exception of the proportion of heifers and cows, to an earlier cattle survey (1957) of the Il Chamus area conducted by the Baringo District Range Officer at the time.⁷ In a sample of 22,981 cattle, herd structure was as follows:

<u>Calves</u>	<u>Immature Bulls</u>	<u>Mature Bulls</u>	<u>Ox</u>	<u>Heifers</u>	<u>Cows</u>
19%	9%	6%	8%	16%	42%

Given that 1956 and 1957 represent non-drought years, the proportion of cows in the above would be expected to be much higher than in Table 2. The combined figure (58%) for adult females, including both heifers and cows, is approximately equivalent to the figure (62%) for the same category in Table 2.

7. Based on data from Range Management Files, Ministry of Livestock Development, Marigat, Baringo District.

The large standard deviations cited earlier for livestock holdings in Njemps are evidence of a highly unequal distribution of livestock ownership. Such a pattern makes it extremely difficult to discuss "averages" in regard to Il Chamus livestock holdings. Table 3. below demonstrates just how polarized livestock ownership is in Njemps. Figure 1. illustrates the relationship on a graph. For calculation purposes, a stock unit (S.U.) is assumed to be six small stock or one head of cattle. This best approximates the market value of the animals in Njemps.

Table 3. Ownership of Stock Units, Njemps Location

<u>% of Families (n = 71)</u>	<u>% of S.U. Controlled</u>	<u>Average S.U. per family</u>
10%	46%	166
20%	19% (65%)	69
30%	12% (77%)	43
40%	8% (85%)	29
50%	5% (90%)	18
60%	4% (94%)	14
70%	2.6% (96.6%)	9
80%	2% (98.6%)	7
90%	1.2% (99.8%)	4
100%	.2% (100%)	.7
	Average family of 7	= 36

As the above table indicates, the richest twenty percent of livestock owners in the sample control sixty-five percent of total stock units. And these families have average herd sizes of over 100 stock units. The poorest fifty percent of households, in turn, have access to only ten percent of total stock units in Njemps. Families in these percentiles have average herd sizes of under 10 stock units.⁸ At present, five percent of Il Chamus families have no stock at all and are mainly employed as casual labourers for the rich stockowners or for the Perkerra Irrigation Scheme.

8. As will be shown later in the paper, livestock ownership is slightly more polarized in areas where crop production is important than it is in regions which are more strictly focused on livestock production. In Table 3., the sample was drawn from areas where cultivation is important, i.e., the Ngambo and Eldone areas.

2.2 Livestock Marketing

Despite the stratification which exists in terms of livestock ownership, income from the sale of livestock accounts for the majority of most household incomes in Njemp and is responsible for approximately sixty percent of total cash income in Njemp. Only in the bottom three percentiles of households (bottom thirty percent in Table 3.), does non-pastoral income, in this case off-farm employment, account for a greater proportion of average household income than cash earned from livestock sales. In terms of all livestock owners represented in Table 3., average annual income per household from the sale of livestock is 1298 Kenya shillings. As would be expected, however, the range in income from stock sales varies considerably between the rich and poor families. In the sample of seventy-one families, household cash earned from the sale of stock ranged from 0 to over 9000 Kenya shillings per year. For reasons to be discussed later in the paper, cash incomes per household from the sale of livestock do not increase proportionate to the size of herd. At present, small stock sales in Njemp account for approximately two times as much cash income as that earned from cattle sales.

How the Il Chamus respond to livestock marketing is a very complex issue and concerns a number of factors such as the condition of range and livestock at the time of sales, relevant social factors such as brideprice demands and livestock loaning, size of the herd, cash needs and the price being offered at the market or by the trader (cf. White and Meadows, 1979). In a survey of ninety-four herdowners, fifty-one percent of the sample said that price was the major factor influencing whether or not they marketed an animal, while forty-nine percent cited cash needs as the most important criterion for determining stock sales. Actual marketing patterns in Njemp for the past twenty-five years reflect these findings in that the dry season month of December, when cash needs are highest because of the decline in milk production and increased dependence on grains, is also the largest volume month in terms of stock marketing (cf. Little, 1981: 83). Moreover, this is also the month when livestock prices on average are highest in Baringo because of the increased demand in other parts of Kenya for meat during the Christmas period. This is well illustrated in the Baringo case where, for example, prices for small stock at the Baringo County Council Auction (Marigat) in December, 1980 were approximately twenty-five percent higher than for any other month during 1980. Months, in turn,

when volume of marketed stock has been lowest in the past twenty-five years are the wet season months of April and May. This is the case in spite of the fact that there is not a significant drop in price from other months with the exception of December. April and May are the months when cash needs begin to decline due to the availability of milk and alternative food-stuffs such as wild vegetables. It is also a time during the year when range conditions are especially good and Il Chenus herdowners are often purchasing livestock during these months.⁹

The formal livestock marketing system (Baringo County Council) of Baringo District is responsible for the marketing of the majority of cattle in Njamps Location, but less than twenty percent of marketed small stock. The largest percentage of marketed small stock are sold to traders from south Baringo and a few from Nakuru District. Outside of Mari-gat, there are no butcher shops within Njamps Location; however it is common for a local herdowner to slaughter a goat in the bush and sell the meat at approximately eight Kenya shillings per kilogram (bone included). It is also a standard procedure in some areas of Njamps for small stock to be exchanged directly for maize at the price of two "debos" (32 kg.) of maize for one small stock of approximately seventy shillings value. In such exchanges, the price of maize remains constant at 2/25 shillings per kilogram and if three "debos" of maize are exchanged then the goat exchanged must be worth approximately one hundred shillings.

Table 4. depicts the percentage of stock sold through the various available marketing channels in Baringo District and the average prices paid for the stock. The table is based on data collected monthly from fifty-eight Il Chenus households during the period June, 1980 to February, 1981.

9. This is obviously an oversimplified discussion of Il Chenus responses to livestock marketing. A more detailed, quantitative analysis of livestock marketing dealing with price responsiveness and other relevant factors will be included in my dissertation thesis.

Table 4. Livestock Marketing, Njerops Location

<u>Market Outlet</u>	<u>%Total Cattle</u>	<u>%Total Shoats</u>	<u>Avg. Catt. Price(Shs.)</u>	<u>Avg. Shoat Price (Shs.)</u>
County Council	73%	13%	492 (280-1180)	92 (30-170)
Private Traders	27%	52%	429 (200-680)	81/55 (50-170)
Slaughtered and Sold (Bush)	---	16%	---	82 (45-145)
Exchanged for Maize	---	14%	---	32 kg. maize
Averages			448 (200-1180)	85 (30-170)

*Goat prices tend to be twenty percent higher than prices for sheep.

As table 4. indicates, average prices per head of cattle and small stock are respectively 448 shillings and 85 shillings, low for most livestock producing regions of Kenya (cf. Matthes, 1979). Comparitively, livestock prices in Kitui District, for example, are almost two times the price of those in the Il Chanus area (personal communication, James Ayres). On a per kilogram basis (liveweight), average producer price for cattle at Marigat auctions is 2/20 per kilogram. This explains, in part, why the Il Chanus, unlike most other groups in Kenya, very much favour selling cattle to the Livestock Marketing Division (IMD) with its present producer price of 3/20 per liveweight kilogram. The low stock prices paid at the Marigat auctions seem to be related to monopsonistic buying at the next stage in the marketing hierarchy when the cattle are sold in Nakuru District.

Although present prices for livestock are low, there seems to have only been minimal changes in stock prices at Marigat in the past eight years. This is surprising given the general inflationary trend in recent years for other food products in Baringo District. Maximum and minimum livestock prices for the 1974-1981 period are given in Table 5; average prices are not available for this period.

Table 5. Maximum and Minimum Livestock Prices, Marigat: 1974-1981

Year	Cattle		Small Stock	
	Low (shs.)	High (shs.)	Low (shs.)	High (shs.)
1974	70	1010	15	182
1975	65	1140	24	253
1976	65	1335	18	205
1977	150	1355	18	200
1978	?			?
1979	IMD Auctions		cancelled due to CCPP	
1980	230	1200	40	220
1981	210	1400	30	220

* Based on Monthly Veterinary Reports, Marigat, 1974-1981.

As the table indicates, there has been very little change in maximum prices at Marigat in the past eight years, indicating perhaps a general deterioration in the quality of livestock during this period (personal communication, Jeffrey Lewis). Minimum cattle prices, however, shown an increase since 1974. In terms of small stock, there has been very little increase in either minimum or maximum producer prices since 1974. It should be noted that the new tarmac road to Baringo District from Nakuru should increase livestock prices in the area in the near future.

During this same time period (1974-1981), institutional factors related to marketing have also adversely affected livestock producers in Njemps. These are mainly considerations which are exogenous to the realm of control of the individual stockowner. For example, on an average of five months in each year since 1975, livestock auctions at Marigat have been cancelled due in most cases to Foot and Mouth disease outbreaks. At the producer-level such closures make it very difficult to plan marketing strategies; most marketing bans occur without prior warning and are usually lifted in the same fashion. This is especially problematic when the producer out of necessity is linked to a cash market, especially in regard to the purchase of foodstuffs such as posho (maize meal). Not surprisingly, the Il Chamus view livestock marketing as a major problem and a survey conducted in 1980 (n = 70) revealed that eighty-nine percent of them wished that cattle auctions were held more frequently.

3. Crop Production Dimension of Il Chamus Economy

3.1 Increased Crop Production

In addition to livestock marketing, a discussion of the regional grain trade in Baringo District is also pertinent for understanding, in part, the pressures which have led to increased crop production in Njemp Location. As economists and other social scientists (cf. Lees and Bates, 1977; Little, 1980) have pointed out, household production strategies cannot be viewed in isolation from the marketing aspect, especially in regard to a livestock producer's decision to diversify his/her household economy (i.e., incorporate more grain production). This is especially relevant in the Il Chamus case where, although the prominence of grain in the diet has increased in the past thirty years due to some extent to increased human population resulting in reduced livestock/person ratio, imported grains have always assumed some importance in the local diet. To quote a colonial source from the 1940s (Colony and Protectorate of Kenya, 1940: 9): "The supply of posho to the trading centers serving the plains people (Il Chamus, Tugen and Pokot) necessitates heavy imports during the dry season and constitutes the bulk of the trade of the district." That the Il Chamus, as well as their Baringo neighbours, have always relied on non-pastoral products for consumption, even in the 1930s and 1940s when average stock holdings were over fifty stock units per family of seven, is probably related to the unimodal rainfall pattern of Baringo District. Such a rainfall pattern results in an annual dry season of seven to eight months. At this time of the year, milk production from cattle is reduced to nil.¹⁰ Posho consumption during these times increases to .7 kilograms per adult unit, an approximate increase in grain consumption of over four hundred percent of grain consumed in the wet season. At present, the average Il Chamus family of seven consumes 779 kilograms of posho per year. Translated to the locational level, Njemp Location imports over 8000 sacks (90 kg. each) of maize per annum, the equivalent of 1,440,000 Kenya shillings.

While dependence on posho in the Il Chamus diet has increased in recent years, regional changes in grain marketing and landuse patterns in Baringo have adversely affected households specialized in livestock

10. Human consumption of milk (cattle, goat and sheep) per adult unit varies from .58 liters to 1.75 liters in the wet season to .49 liters to under .1 liters in the dry season. At the end of the dry season, usually only goats and sheep are milked and milk production per animal is respectively .16 liters and .05 liters.

production and thus dependent on markets to buy grain. The most important regional changes outside of Njemps that have taken place in Baringo in the last ten to fifteen years are: 1) a shift in South and North Baringo's high potential areas to crops such as pyrethrum, coffee and wheat; and 2) a decline in private grain trade and a more dominant role for government parastatals in the marketing of grain in Baringo. While the former change has reduced the amount of agricultural land devoted to such food crops as maize and finger millet, the latter has created inefficiencies in the present grain marketing system in Baringo. Of the two changes stated above, the most relevant to the Il Chamus producer is the recent transformation in Baringo's grain marketing system. In part, this has resulted in higher retail prices for maize in Njemps. The maize producing region of Baringo which has been of most importance to the Il Chamus in the past is the Eldama Ravine area, South Baringo. From the late 1940s until the 1970s, most of the maize consumed in Njemps came from this region. The grain was usually transported to the grain deficient areas of Njemps by a network of traders who either bought the maize directly from the farmers or from middlemen. To a lesser extent, such a free trade network also existed in the Kabartonjo area of the northern Tugen Hills. The first serious market interventions in this intra-district trade occurred in the mid-1960s when the government attempted by establishing government buyers in the area to control surplus maize marketed from South Baringo. Among some Baringo District officials, such an initiative by the government was viewed as potentially detrimental to the residents of North and East Baringo. I quote (Republic of Kenya, 1968: 1):

Formerly, till 1965, Lenbus Location (South Baringo), 1/20 the size of Baringo, was considered the granary of Baringo District and maize produced there was sold gisted to posho at 45 shillings per bag within the district only. In order to increase the amount of home-grown maize, Perkerra Irrigation Scheme was established during the emergency period with a view to growing more maize for feeding the famine-stricken community in North and East Baringo. During the said era, maize could not be exported from the district by any means available....The prevailing and expanding price of maize are artificially induced by Maize and Produce Board which exports maize from Lenbus to Nakuru, and then sells it back to residents of Baringo at approximately 200% increased price for posho even before it enters the trader's hands....Nevertheless with maize 22/60 a bag to the grower in South Baringo and 70/ the same bag retail in Marigat; the existing state of affairs is most unsatisfactory.

11. Although the Perkerra Scheme was initially devoted to maize, at present over ninety percent of hectareage on the Scheme is devoted to the production of cash crops, chillies and onions.

The astute insights of this "free market" oriented official quoted above did not stop the trend of government control of maize marketing in Baringo. Now in almost all the surplus maize producing areas of the district government control of marketing is the norm. Traders, who as late as 1978, purchased maize within Baringo District, must now travel to Nakuru in order to buy maize. In terms of transport alone, extra costs at present are /15 per kilogram by the time it arrives in Marigat. Not only have the marketing changes resulted in higher prices for grains in Njemps, the Il Chamus have also lost access to the informal maize distribution system which in many cases was more dependable than the present system.¹²

The market and demographic pressures cited earlier have, as would be expected, have led to a greater diversification of the Il Chamus economy. This has meant a steady growth in crop production in Njemps in the past fifteen years. An indication of the present seriousness, on the part of the Il Chamus, is their renewed interest in irrigated agriculture. As opposed to dryland cropping, irrigation for the Il Chamus has a very different connotation. It implies a sense of permanency which is not perceived with dryland cropping. Irrigated agriculture also involves a far greater investment in effort and organization than is the case with rainfed agriculture. More importantly, unlike rainfed farming areas, irrigated farms can be considered to be individually owned and in some areas is now being bought and sold. Increases in Il Chamus irrigated agriculture since 1970 can be documented as follows:

Table 6. Estimated Increases in Irrigated Agriculture, Njemps
Location: 1970-1981

Area	1970		1981	
	no. farmers	ha.	no. farmers	ha.
Ngambo	82	49	157	151
Lamelok	--	--	63	19
Eldume	34	16	38	20
Loininango	--	--	26	24
Rukus	--	--	21	22.8
Mukutani	40?	20	52	25

12. Translated to the livestock-producer level, a goat in Njemps was equivalent on the market in 1969 to 3-4 debes of maize. At present, the exchange rate is two debes of maize per goat. Similarly, prices for finger millet in relation to livestock have also increased; the amount of finger millet the Il Chamus could buy for one goat in 1969 now must be exchanged for two goats.

Table 6 (cont.)

Totals	156	85	357*	251
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* Represents twenty-nine percent of all Il Chamus families.

Based on my own data and Baringo Pilot Semi-arid Area Project Crop Survey, 1981.

As the table indicates, total irrigated land has increased over 300% since 1970. The largest single increase in total irrigated land during this time period took place in the post-drought years (1980-1981) when cultivated land increased approximately thirty percent. This was especially the case in the Loininange and Rukus areas where there were very heavy livestock losses. During the time period represented in Table 6., Njemps Location has gone from being ninety percent dependent on imported grain to now having to import only seventy percent of its grain needs.

Increased opportunities for irrigated agriculture have not been distributed evenly among households in Njemps due to the fact that only the wealthier families who have access to much family (i.e., more than two wives) labour and capital can cultivate large, irrigated farms. Labour requirements and production ^{figures} per .5 hectare irrigated farm are listed in Table 7.

Table 7. Labour Requirements and Production for Irrigated Agriculture (per .5 ha.)

<u>Field Preparation (pre-planting)</u>	<u>Mandays</u>
Fencing and Clearing	65
Cultivation and Basin Construction	<u>64</u>
	129
<u>Planting, Watering and Weeding</u>	
Planting	9
Watering and Canal Maintenance	18
Weeding	<u>40</u>
	67
<u>Harvesting and Threshing (per 450 kg. unit)</u>	
Harvesting and Threshing--Maize	19
" " " --Finger Millet	76
" " " --Beans	50

Table 7 (cont.)

		Prod. (kg.)
Total = Maize *	215	642
F. Millet	272	364
Beans *	246	250

*Local varieties

** Manday = 6 hours

Male/Female Age 7-14 = .75 Manday

Male/Female Age 15-60 = 1 Manday

Male/Female Age 61-75 = .5 Manday

Most irrigation schemes in Njemps Location are similarly constructed so that labour inputs per .5 hectare for the different schemes are relatively consistent. All the irrigated farms use a rectangular basin system whereby rows of basins are constructed, each basin being approximately 2.5 meters x 4 meters. Between each row of basins, there is a canal where water passes and is directed into each basin by entrances made on the topside of the basin. Variations in labour requirements for irrigated agriculture are mainly determined by four criteria: 1) the amount of clearing needed at the beginning of the season; 2) the amount of fencing needed; 3) the length of the main canal; and 4) weed growth.

3.2 Economic Costs and Returns of Irrigated Agriculture

Labour costs are the main source of financial commitments to irrigated cropping in any given year in Njemps and the use of hired labour is widespread. In all Il Chanus areas, labour is completely monetized and even when traditional beer is brewed for work parties, the employee has the choice of either drinking a certain amount of beer or being paid the cash equivalent. Labour is usually paid for on a piece-work fashion as follows: basin construction is 1/ to 1/50 each; fencing is 400/ per hectare; weeding is 1/ to 1/50 per basin; and planting /50 per basin. The average agricultural wage for a six hour day is seven shillings and only varies in the Ngambo area where labour costs are nine shillings per day. In this region, the proximity to the Perkerra Scheme necessitates that wages for casual labour in Ngambo must be competitive with the Scheme's wage of 8/90 per day.

In the sample of fifty-eight households stated previously, families of seven were able to cultivate irrigated farms of .5 hectare or less without the use of hired labour. Richer households with two wives or more and average family size of ten members were capable of cultivating up to .7 hectares without cash labour costs. Families with only four members, which represents mainly the poorer families, were able to only cultivate .3 hectares of irrigated land utilizing only household labour. Eighty-three percent of the farmers in the sample with farms of .8 hectare or more employed non-family members to work on the farm.¹³

Costs of production for irrigated agriculture are such that given the average Il Chamus cropping pattern of 8/10 maize, 1/10 finger millet and 1/10 beans, marginal returns per hectare after a threshold of three hectares do not offset one's labour costs for most families. For a family of ten with six members over the age of ten years, it is necessary to hire labour for almost all agricultural tasks for any increments in farm size after two hectares. Marginal returns per hectare in the sample of fifty-eight households were approximately 2500 shillings for the first hectare, 1900 shillings for the second hectare, and less than 50 shillings for the third hectare cultivated. (The last figure is derived using production costs for smaller farms, since no farm in my sample using only manual labour was larger than two hectares). These calculations are based on the assumption of zero opportunity costs for family labour on the farm (mainly women). Moreover, it should be noted that cash returns per hectare do not actually represent earned cash income, but rather the monetary value of the crops produced which in some cases were consumed totally at home by family members.

13. A major topic of my dissertation will be the role of kinship and other network mechanisms in mobilizing non-household labour. In the main area under consideration here, Ngambo, such extra-domestic mechanisms are not important.

The use of hired tractors from the Perkerra Irrigation Scheme has, for very good reason, been especially popular among the richer Ilchamus farmers in the irrigated areas. For a cost of 150 shillings per acre, much of the labour in the pre-planting stage is minimized at a time when labour bottlenecks tend to be most severe because livestock are receiving much attention at this time (i.e. February and March). In a .8 hectare plot, production costs for cultivation and basin construction are reduced by sixty-two percent when one uses a tractor; basins must still be constructed but price per basin when tractors are used drops from 1/50 to -/50 per basin. The profitability of cultivating large farms has meant that overall hectarage in areas where tractors are used has increased over areas where farms are still cultivated by hand. In the only Ilchamus area where tractors have been used for the past two years, Ngambo, average farm size for farmers who hired a tractor is 1.89 hectares. This is more than two times the average irrigated farm holding in Njemps.

Since access to capital (livestock) and large inputs of family labour is restricted to the wealthier families, it is not surprising that one finds ownership of irrigated landholdings polarized.¹⁴ Concentration of land ownership tends to be highest in the Ngambo area where, as stated above, some farmers use tractors. In this area, ten percent of the farmers control thirty-nine percent of the irrigated land and twenty percent of the farmers own sixty-one percent of irrigated land. The bottom fifty percent of farmers in terms of land ownership control only eleven percent of the irrigated hectarage in Ngambo. In Eldume, on the other hand, where tractors are not available land is more equitably distributed. This is illustrated by the fact that ten percent of the farmers in Eldume control only twenty six percent of the land (20% of the landholders own forty-eight percent of irrigated hectarage), while the bottom fifty percent of landholders have access to twenty percent of irrigated land. Reasons for the more

14. Land ownership in the area tends to be more equitably distributed than stock ownership because labour is not such a constraint in the accumulation and production of livestock as it is in crop production.

equitable tenure pattern in Eldume relate to the non-profitability of cultivating large farms using hired labour as the main input.

4. Mixed Livestock Enterprises: Some Factors to be Considered

4.1 Crop Production and Its Effect on Livestock Holdings

That increased food crop production will lead to a decline in livestock numbers, as had been predicted by development planners, is not the case in Njemps Location (cf Government of Kenya, 1980).¹⁵ In fact, it is the area of Njemps, Ngambo, where crop hectorage is greatest that one also finds the largest number of livestock. That crop production will appeal mainly to the poor stockowners is also invalidated in the Il Chamus ease, Unlike Turkana and other pastoral areas (cf. Broch-Due and Storas, 1980:14), wealthy Il Chamus households of Ngambo and neighbouring areas are able to maintain a viable production unit with investments in both the pastoral and agricultural sectors. This is achieved mainly because of the sedentary nature of pastoralism in the area and the region's readily available supply of hired labour.¹⁶ In this regard, it is the wealthy stockowners of Njemps which are more capable of managing a mixed livestock cropping enterprise. Table 4 indicates the relationship between irrigated farm size and livestock holdings among 90 randomly selected households in the Ngambo, Loiminange and Eldume areas. Figure 2 illustrates this on a graph.

15. The planned irrigation scheme in Sandai, Lobo Location, an area which borders the Il Chamus region, is also based on the premise that increased grain production will lead to a reduction in Sandai livestock numbers (cf. Republic of Kenya, 1981).

16. As mentioned earlier, the paper focuses on the area of Njemps where the pastoral system centers on the swamps. This represents more than seventy percent of total Ilchamus families. In eastern Njemps, where dry season livestock movements are to the hills toward Laikipia, households have more difficulties in establishing stakes in both pastoralism and agriculture.

Table 8: The Relationship Between Irrigated Landholdings and Livestock Numbers, Njemps Location

<u>Percentile of Stockowners</u>	<u>Average Stock Units (range)</u>	<u>Average Shamba Size (ha.) (range)</u>
10%	148 (99-296)	1.6 (0-3)
20%	70 (47-95)	1.35 (0-4)
30%	37 (30-47)	.76 (0-3)
40%	24 (22-30)	.76 (0-3)
50%	16 (14-20)	.34 (0-.8)
60%	12 (11-14)	.4 (0-2.2)
70%	9.5 (8-11)	.17 (0-.4)
80%	6.2 (5-8)	.13 (0-.4)
90%*	3.9 (3-5)	.21 (0-1.35)
100%*	.89 (0-3)	.12 (0-.4)

* In the sample, people with under 5 S.U. represented 18% of the total households and had an average farm size of .08 ha.

Table 8 and Figure 2 illustrate that stock units tend to increase in relation to size of irrigated holding. However, ranges in farm sizes within each wealth category tend to be considerable. That some wealthy stockowners do not have irrigated farms is probably more a function of age than anything else. Older, rich stockowners over the age of sixty years tend not to invest in cultivation in many cases because their grain needs are met from their sons' farms. Some elderly livestock owners at the time when irrigated agriculture opportunities became available were heads of families which were at what Fortes (1958:5) calls the "dispersion stage" in the developmental cycle of the family. This is the phase in family development when sons and daughters begin to marry and leave their household in order to establish their own homesteads. The loss of family labour as well as perhaps a lack of ambition among these households to diversify the household economy at a late age may also be reasons for the lack of irrigated farms among some wealthy stockowners.

As Figure 2 indicates, it is not until after 1.0 hectare that stock units begin to increase exponentially. Grain self-sufficiency for a family of seven in the irrigated areas is achieved at .7 hectare, if .6 hectare are devoted to maize and .05 hectare each to beans and finger millet. If we use the average family size of ten with six members over the age of ten years, which approximates the family unit of stockowners with stock unit holdings over seventy, then grain self-sufficiency for the family is reached at approximately 1.0 hectare. Production above costs after this point can be sold or exchanged directly for livestock as is quite often the case. Moreover, grain self-sufficiency at the household level greatly reduces family expenses since purchase of maize meal accounts for over sixty percent of average household expenditures. That savings in cash allocations for maize meal will be diverted to other consumption items does not seem to be the case. Other than perhaps additional purchases by the wealthy households of clothes, cooking utensils and other "luxury" articles, consumption activities between the rich and poor households do not vary as much as the differences in their economic statuses would imply. Stated differently, Il Chamus household consumption patterns do not increase in proportion to the amount of livestock or irrigated land a family owns.

In the irrigated areas, grain production actually serves to support the livestock sector since it reduces the need to deplete herds to buy grains. It also allows surplus from agriculture to be invested in livestock.¹⁷ This is best illustrated by examining livestock investment patterns among households in two different areas of Njemps. These are: 1) Ngambo where, as mentioned earlier, irrigated agriculture is widespread and grain self-sufficiency in the region is approximately fifty percent; and 2) Salabani, a region where there is virtually no irrigated agriculture at present and ninety-nine percent of local grain needs must be imported. In a survey of thirty-two households from the former area with average farm size over .8 hectare, eighty four percent of the sample had bought livestock in the past year. Average stock purchased per herd-owner was 3.6 cattle (range 0-35) and 5 small stock (range 0-40). In regard to cattle, the majority was purchased from South Baringo livestock traders often at an exchange rate of six to seven small stock for a heifer or a young bull. Those cattle purchased locally in Njemps came from the main Il Chamus grain deficient areas, Salabani and Loiminange. In these two sub-locations, herdowners are inclined to sell livestock in order to buy grain. Of the small stock purchased by the Ngambo households, over seventy percent were purchased locally in Njemps and twenty-two percent of the small stock purchased was paid for in exchange with maize at the rate of thirty-two kilograms of grain per small stock. Much of this latter trade took place between households from Ngambo and Salabani.

Livestock purchasing patterns in Salabani, on the other hand, differ from those described above. In a survey of twenty wealthy herdowners (average holding of over fifty stock units) representing some of the most active marketing (both buying and selling) households in the area, only forty-five percent of the stockowners had bought livestock in the past year. Purchases per

17. At present, land for livestock only competes minimally with cultivated land. Stock are mainly grazed in the swamp areas where farms are not found and animals are always grazed on harvested fields. Trespass of stock in cultivated fields is common, but serious disputes tend to be minimal because most rich farmers also have large investments in livestock.

household were on average 1 cattle (range 0-5) and less than one small stock (range 0-3), approximately $\frac{1}{4}$ of average livestock investments in Ngambo. Moreover, in terms of livestock sales, seasonal livestock marketing patterns in Salabani differ from those occurring in Ngambo. This is especially in regard to the immediate post-harvest months (October-December) when home-grown grain is available and marketing of stock per household in Ngambo declines as much as thirty percent. Such a radical change in household marketing behavior does not occur in Salabani in these months of the year.

4.2. Irrigated Agriculture and Its Impact on Equity

Differentials in property ownership in Njemps are most salient in the Ngambo area where polarization of livestock holdings is fifteen percent greater than patterns revealed in other Il Chamus areas. Explanations for the greater inequity in Ngambo relate to the fact that unlike other areas of Njemps, possibilities for extension of irrigated agriculture are minimal and the present system of land ownership is now fixed. For one to acquire an irrigated plot in Ngambo, he/she must either borrow land from a friend or kinsmen or purchase the land outright. The latter is difficult since there are few people in the area who are willing to sell their irrigated farms. The cycle of grain production and livestock investments described previously serve to promote the interests of those individuals who had earlier staked out claims to irrigated farms. The lacunae between the rich and poor households in Ngambo seems to be increasing as livestock investments, as well as investments in retail stores and other enterprises, tend to be concentrated among those households with both irrigated farms and large livestock holding. Natural factors such as drought which in most pastoral areas tend to periodically reduce the economic differences between the rich and poor livestock owners is not an effective "levelling" mechanism in Ngambo. In fact, those stockowners with a stake in irrigated agriculture can more easily recover from heavy livestock losses because of the potential for converting agricultural surplus into livestock holdings.

4.3 Crop Production and Rural Development in Baringo District

Given the information presented in the paper relating increased grain production to livestock investments, what are the implications for a cropping policy in regard to rural development in Baringo District. In other words, is it desirable to increase crop production if it serves to support the buildup of livestock numbers in the area? To answer the question, it should first be pointed out that for most Il Chamus households investing in livestock is an option that they do not have the resources to undertake. Unlike the wealthy households (percentiles 1 and 2 in Table 8) who perceive agriculture as a support mechanism for their livestock holdings and investments, the poor households are farming to meet subsistence needs and their farming activities have little relation to livestock buildup. Referring again to Table 8, irrigated farm owners in the fifth percentile and below are not even fifty percent grain self-sufficient and those in the third and fourth percentiles are only borderline grain self-sufficient. The poorer Il Chamus households are actively involved in agriculture and because of the limited number of irrigated farms many are investing in dryland agriculture, an enterprise which entails only $\frac{1}{2}$ the labour costs of irrigated agriculture. Suitable crop packages (i.e. Sorghum and finger millet) for the dryland areas should be encouraged among those households, mainly the poor ones, presently engaged in rainfed farming.¹⁸

If one wishes to control livestock numbers in Njemps Location by such means as establishing grazing fees, a policy which should be made only after a more careful consideration of the productivity of the swamps, the program should not be undertaken at the expense of encouraging crop production. This is especially in regard to the poorer households. Recognition should also be made of the fact that while a reduction in livestock

18. This is the present crop policy of the Baringo Pilot Semi-Arid Area Project.

numbers may serve soil conservation and range management purposes, it also has the potential of reducing household incomes among the seventy percent of Il Chamus households which presently derive the majority of their cash income from the sale of livestock. Under these circumstances, such a decline in per capita income will occur unless alternative sources of income are made available in the area. Finally, the establishment of a program based on grazing fees may incur costs to the producer which cannot be made up from the added market value of the animal maintained under a more favourable stock unit to rangeland ratio. That is to say, the increased value of better managed indigenous cattle, Zebu, may not offset the costs of grazing fees. Another factor which may serve to reduce household incomes in Njemps.

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