RESOURCE USE IN A MEDIUM POTENTIAL AREA: THE MBERE RURAL ECONOMY

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1. INTRODUCTION

Partly in consequence of the chronic droughts that in recent years have afflicted large areas of the African and Asian continents combined with the continuing population growth in the third world there is now an increased interest in the problems of the semi-arid areas. In Kenya alone Mbithi and Wisner state that over 4 million people are constantly threatened by drought and environmentally derived stress.(1) Confronted with a problem of this magnitude, it would seem self-evident that the search for developmental solutions should be both wide ranging and flexible. It is therefore distressing to find that in practice the approach of a quite large number of planners, administrators and academics to this search is confined within the barriers of traditional administrative fields and academic disciplines. Such an approach is illustrated in the report by Berry et. al. "Human Adjustment to Agricultural Drought in Tanzania,"(2) which focusses solely on the agronomic aspects of adjustment.

While not wishing to derogate the potentially very useful contribution that research in particular fields, and certainly not least in agronomy, can make to the resolution of the severe problems confronting these areas, two points require emphasis. Firstly, humans do not adjust to drought affecting agricultural production solely within the context of farming. Secondaly, a myopic approach to research planning or development administration which assumes that they do is bound to run into serious difficulties quite probably leading to substantial misallocation of resources.

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1. Mbithi and Wisner "Drought and famine in Kenya," I.D.S. Discussion Paper No. 144.

2. University of Dar es Salaam, Bureau of Research Assessment and Land Use Planning, Research Paper No. 13, November, 1972.

For example, strategies of resource concentration in a particular crop, or of risk reduction through introduction of a drought resistant but labour intensive, low value and unpalatable crop or conversely of long-term income increase via a higher value but non-drought resistant crop all are likely to encounter low acceptance rates in an area where risk-avoidance is regarded as making diversification of resource use imperative, and where the endeavour to achieve some minimal stability in income flows has led people to identify and exploit a wide variety of income-earning activities both on and off the farm. Most of these alternative sources of income are common knowledge. Entry into most requires little or no capital/through their exploitation rather than merely survive may require although to prosper more of both. Thus any innovation identified and proposed by, say, the agronomist must be competitive not merely with some other previous innovation of noticeably doubtful success, e.g. cotton in Mbere, but with the whole mix of accepted income-earning activities that rural households, given their individual objectives and available resources, choose to engage in.

Part of the importance of the work of Mbithi and Wisner lies in the breadth of their approach to the study of drought and famine in Kenya. Thus it can be seen from Table 1 that when they examine drought adjustment behaviour their list of adjustments ranges far beyond the purely agronomic.

Table 1

Adjustment Behaviour Towards Drought

FUNCTION OF ADJUSTMENT	SPECIFIC ADJUSTMENTS
Affect the rainfall source	Pay a rain maker; pray; Perform locality purification rites. Seed clouds.
Increase Moisture availability by:	
Change of location	Plant larger areas; plant scattered plots; plant in low-lying wet places; move cattle.
Improve soil moisture storage and distribution	Make ridges; irrigate.
Scheduling for optimal soil moisture	Plant dry; plant with the first rains; plant early; wait to plant only with obviously enough rain; staggered planting; plant without any plan (randomly)
Reduce Moisture need by:	
Eliminate moisture waste	Weed more; stop planting when rains are poor
Change physiological/technical requirements of crops	Plant drought resistant crops; Plant drought escaping crops

(Table 1 Contd.)

Accept or insure oneself against losses	Do nothing; look for wage work nearby; look for wage work far away; sell cattle; use savings; hunt or fish; collect bush foods; store a previous bumper crop; non-farm economic activity (burn charcoal; make bricks; trade; crafts, bee-keeping, beer brewing)
Distribute or share loss	Send children to a kinsman; move to a kinsman's farm; move to a settlement scheme; ask help of friends; family; ask help of the government; ask help/ loan of the cooperative

Source: Mbithi and Wisner, op. cit., pp. 15 and 16.

The purpose of this paper is to present an overview of economic life in one medium - potential* area Mbere SRDP area, Eastern province, and to examine the manner in which the Mbere people have responded to their environment in their attempt to provide for their subsistence and to generate a surplus over and above their basic needs. Some of the material presented confirms data already collected by Mbithi and Wisner and some will supplement their data. In particular it is intended to examine the pattern of resource allocation in Mbere distinguishing between good and bad agricultural seasons, and to present estimates of the returns to labour in different enterprises.

We turn first to consider briefly certain key characteristics of the area.

2. Mbere Division: General Background

Embu District, in Eastern Province, was in 1972 divided into two administrative Divisions: Embu and Mbere. Embu Division lies chiefly to the north and west of Embu town on the lower slopes of Mount Kenya. It is generally well watered and fertile and contains

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* According to Ambrose the classification "medium potential" refers to "those areas where the production of annual field crops is limited severely by lack of available moisture but where the use of out of the ordinary conservation methods and specially adopted crop varieties would make crop production sufficiently reliable for an increased population to be carried." A.B. Ambrose," The Case for Intensified Agricultural Research in the Medium Potential Areas of Kenya," 1972, Ministry of Agriculture.

a good proportion of high - potential land where coffee and tea can be grown, as well as food-crops such as hybrid maize, beans, European potatoes and bananas. In land area upper Embu is much smaller than Mbere which lies to the south and east stretching away from the fertile and well watered lower slopes of Mount Kenya.

In ecological terms Mbere has been likened to parts of Machakos Kitui and Meru districts in Eastern Province and parts of Baringo, West Pokot, Narok, South Nyanza, in Western Kenya and Taita and Tana Districts in Coast Province.[1] It hoped that some of the comments made in this paper may be of interest to planners in these districts.

In 1969 Mbere, excluding Mwea Location, south of the Tana River, became one of the six pilot SRDP divisions in Kenya. The SRDP area covers a land area of approximately 1,630 sq. km. and at the time of the 1969 population census had a population of 64,500, giving an average of 40 people per square kilometre. It is both less fertile and less well watered than upper Embu.

Rainfall maps for the area were presented in an earlier paper, but for ease of reference they are reproduced here also. Both maps show clearly that the incidence of rainfall and the probability of achieving a minimum of 300 mm per season decline as one moves from the west to the east of the division. Map 3 presents the distribution of population in the SRDP area as this was recorded in the 1969 Kenyan Population Census. Comparison of the rainfall and population maps show that 1969 population densities were not solely a function of rainfall (e.g. the thinly populated area of south-west Mbita Location in the extreme west of the division, and the quite substantial area of low population density in the north of the SRDP area to the west of Siakago. According to the 1969 Mbere SRDP Plan this latter area remains thinly populated in response to past

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1. See Mbere Special Rural Development Program, Eastern Province Planning Team, 1969.

traditions of hostility and inter - tribal strife between the Embu and Mbere peoples. It has been suggested that in the case of south - west Mbita a key problem is the shortage of surface and near-surface water.

Map 4 presents a breakdown of Mbere SRDP area into ecological zones. From this it can be seen that the entire area is classified as Combretum Savannah, Combretum Accacia and Accacia Commiphora - all of which are vegetation types typical of semi - arid areas.

As was pointed out in an earlier paper, in this type of environment, with in addition a high incidence of predators to increase the hazards of farming, it is not surprising to find a high rate of out - migration by adult males. At the time of the 1969 census the adult male - female ratio for Mbere SRDP area was 1:1.27.

According to the 1969 population census, in Embu district as a whole 33.3% of household heads are women.(1) This figure is not identical to the estimate obtained by the writer in a random sample survey of 205 households in Mbere SRDP Area conducted in 1973/74, but is quite close to it. The latter survey indicated that in Mbere at this time 28.3% of household heads were women. The census gives/an average of 5.35 people per household for the District as a whole while the same Mbere survey yielded a figure of 4.6. This lower figure may however be at least partly explained by the definition of a household which was used in the survey. Enumerators were instructed to adhere strictly to a definition based on whether or not a group of people regularly ate together. Thus, old people living close to younger relatives and receiving some material assistance from them, but normally eating separately, would be classified as a separate household.

In the survey we found that household size ranged from one to fifteen persons. Producer: dependant ratios were computed for the households interviewed with dependants defined somewhat arbitrarily as those aged 60 and over or 14 and under.(2) The P:D. ratios ranged from 4:0 and 5:1 to 0:4 (an elderly couple and two young children) with an average of 0.99:1. Thus Mbere households are, as we might expect, diverse in size and composition, but face a common problem - the need

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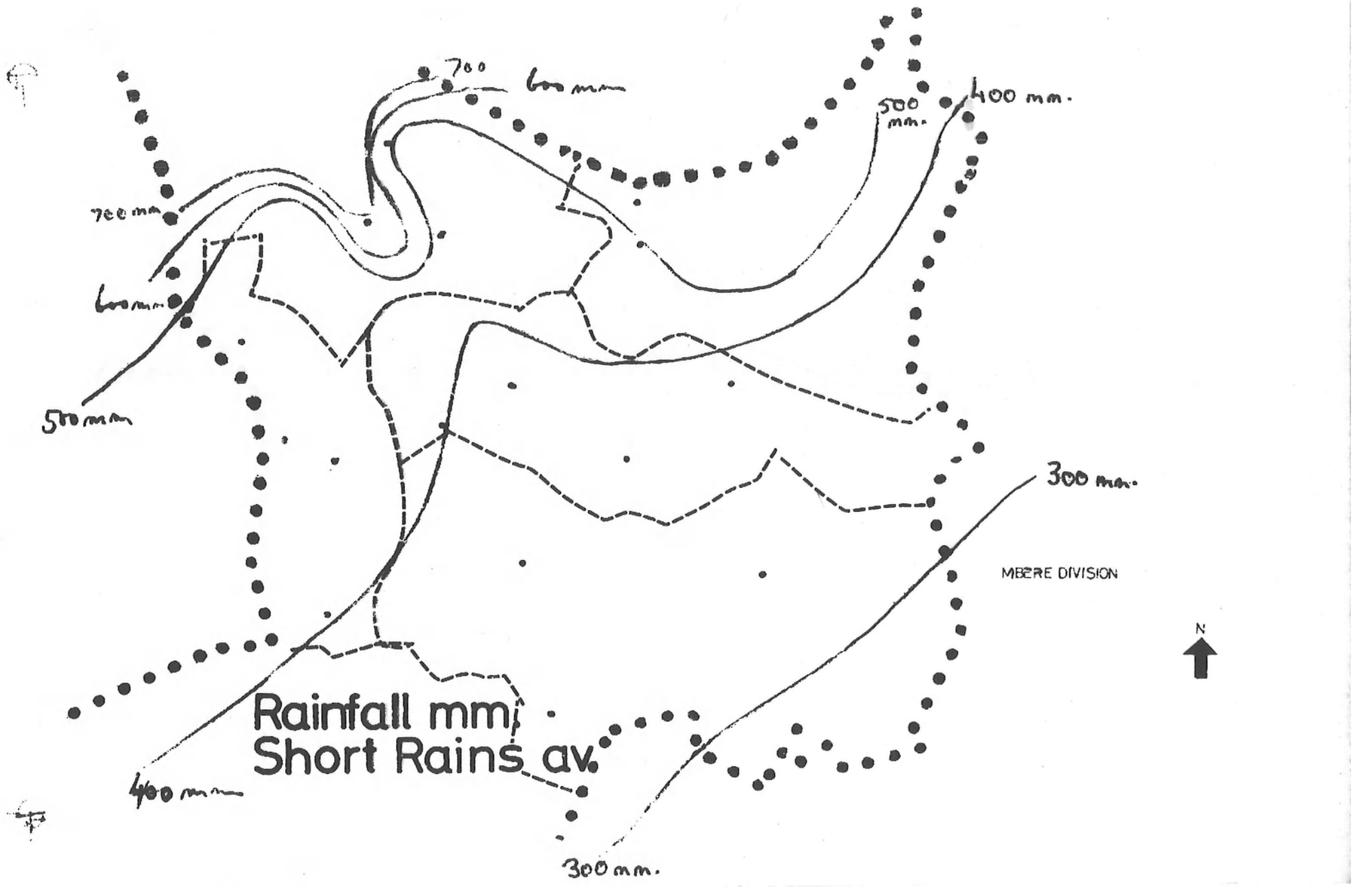
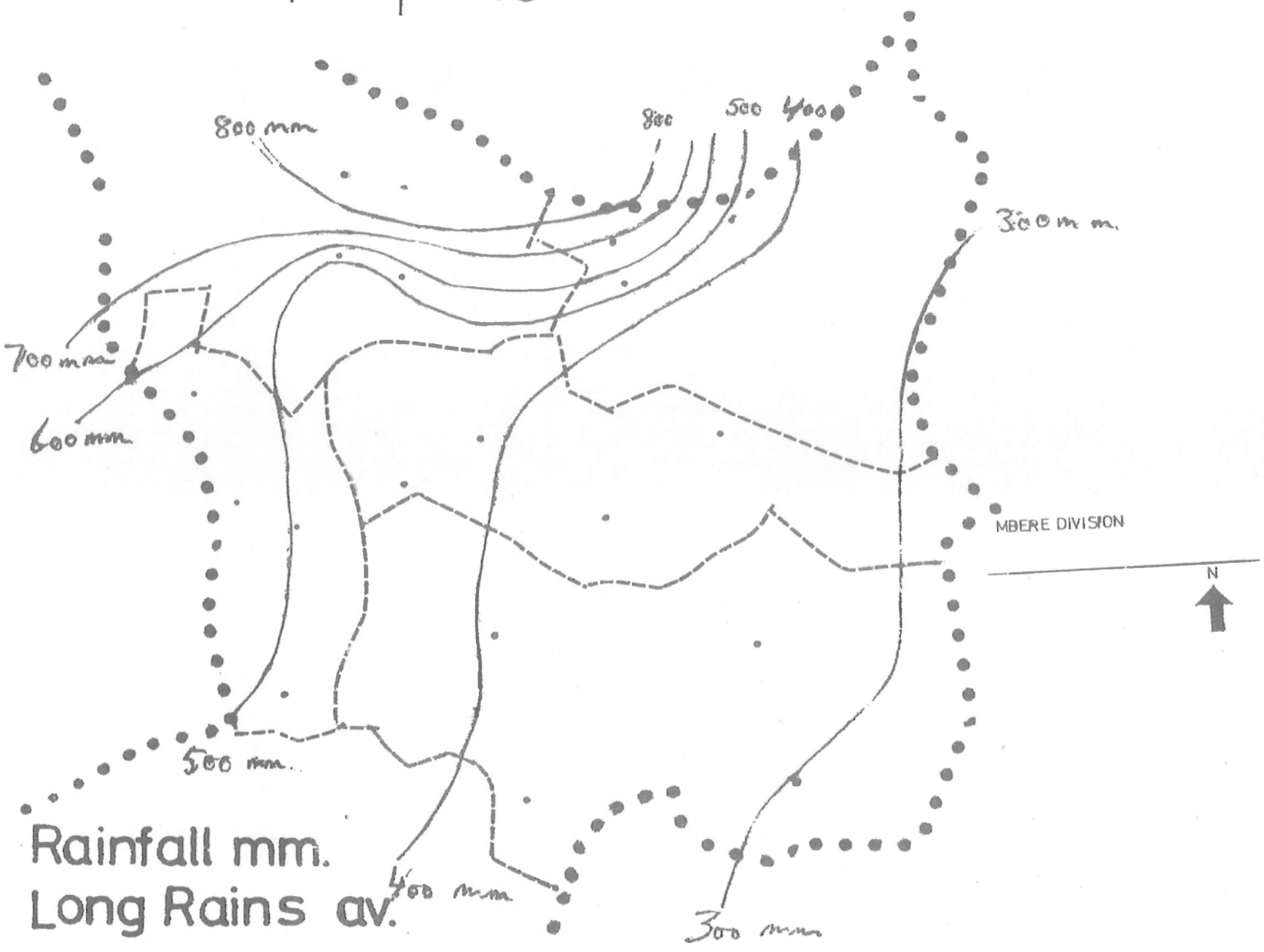
1. Kenya Population Census, 1969, Vol. 3, Table 2, p. 51.

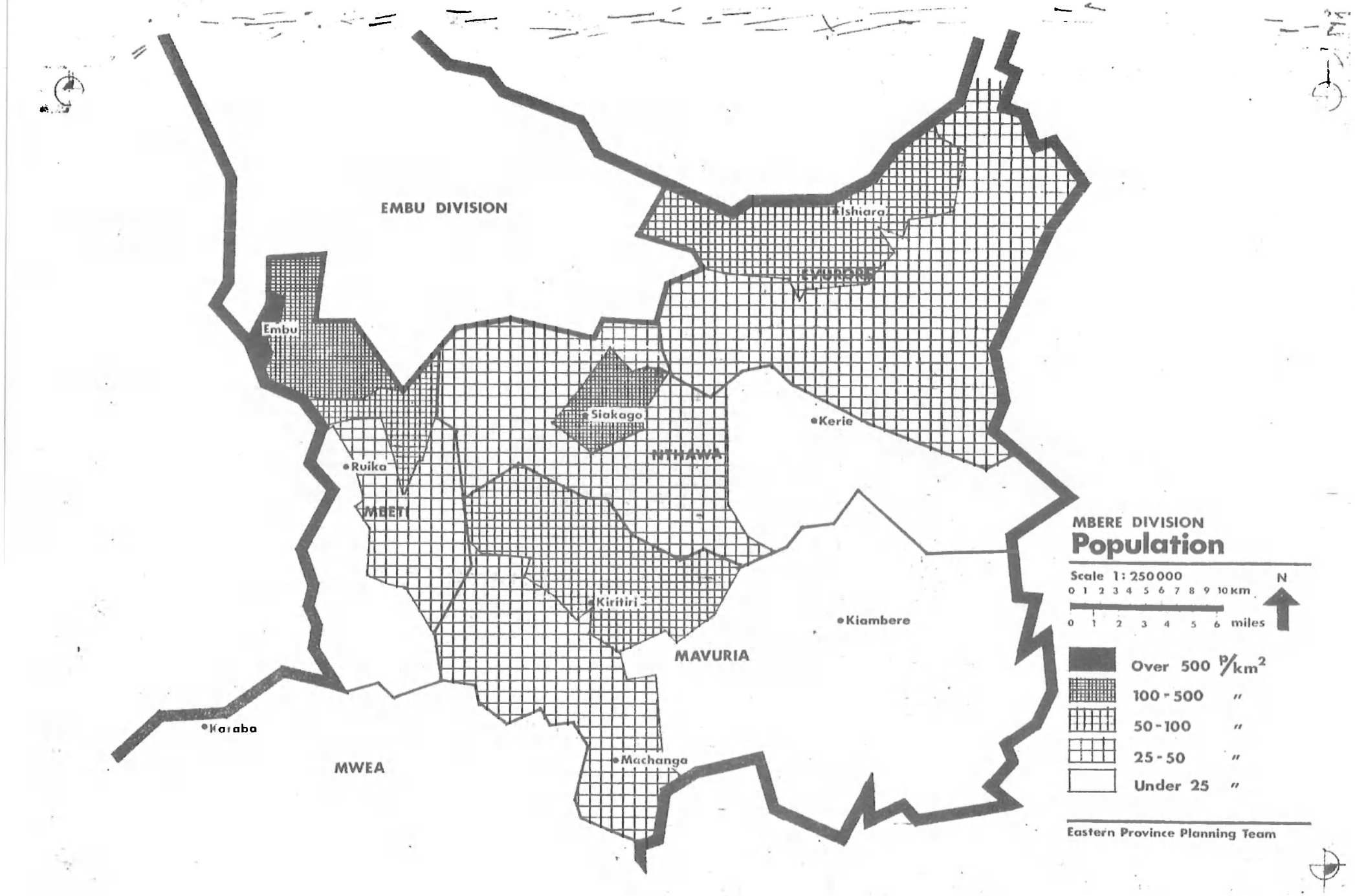
2. In the 1969 Census adults were defined as those aged 16 and over. On the other hand the Economic Survey of Central Province 1963-64 also classified as children those aged under 15.

Map 1

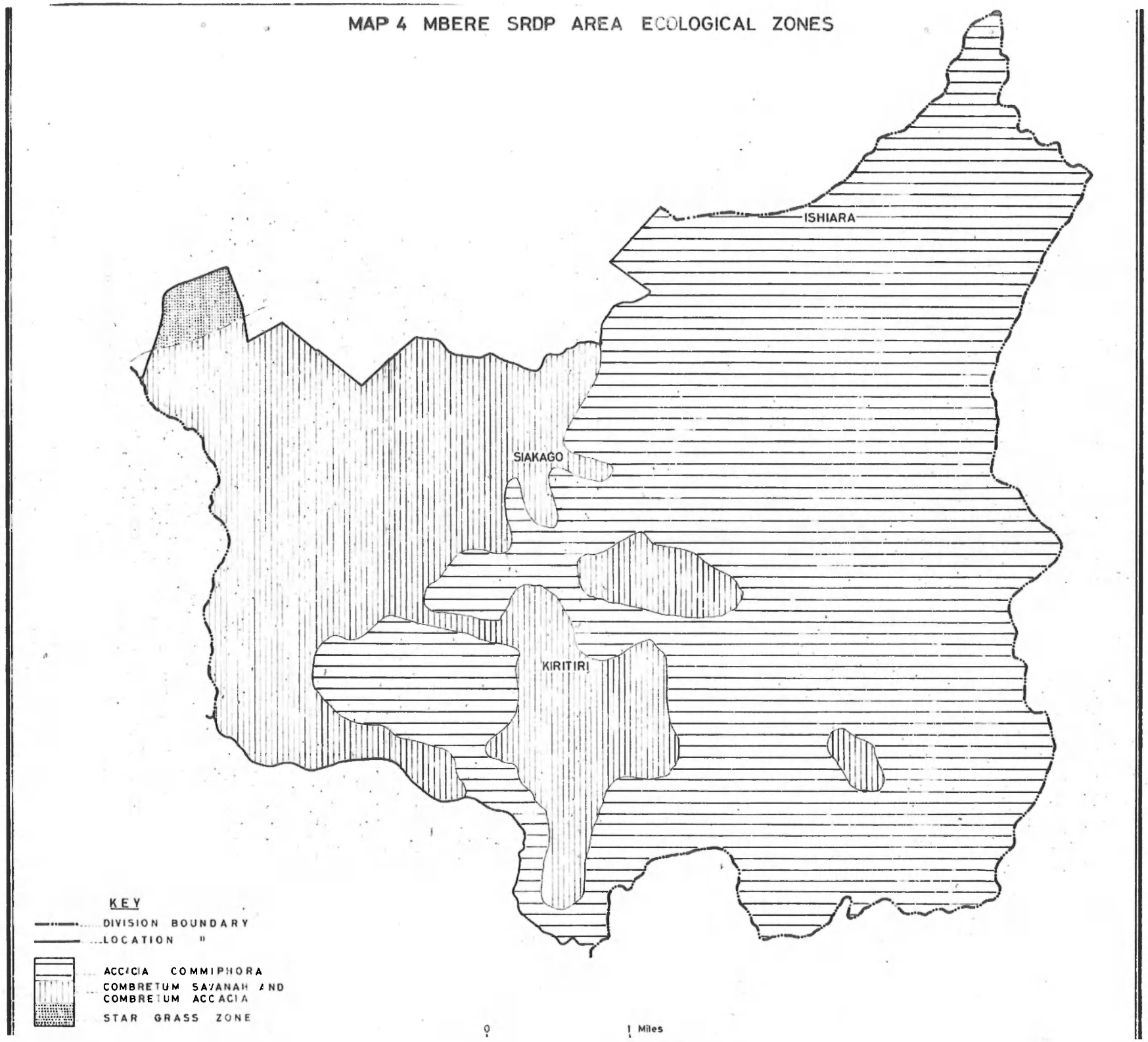

700 mm
600 mm
700 mm
600 mm
500 mm
500 mm
400 mm.
300 mm.
MBERE DIVISION
N
Rainfall mm
Short Rains av.
400 mm
300 mm.

Map 2


800 mm
700 mm
600 mm
500 mm
400 mm
300 mm
MBERE DIVISION
N
Rainfall mm.
Long Rains av.


EMBU DIVISION
Ishiara
Embu
Siakago
Kerie
NTHAWA
Ruika
MBETI
Kiritiri
Kiambere
MAVURIA
Karaba
MWEA
Machanga
MBERE DIVISION
Population
Scale 1: 250000
0 1 2 3 4 5 6 7 8 9 10 km
N
0 1 2 3 4 5 6 miles
Over 500 p/km²
100 - 500 "
50 - 100 "
25 - 50 "
Under 25 "
Eastern Province Planning Team

MAP 4 MBERE SRDP AREA ECOLOGICAL ZONES



to provide for their subsistence and other requirements in an area which is not attractive for agriculture predominantly due to the uncertainty of rainfall.

The data describing economic life in Mbere which are presented in this paper are based chiefly on two surveys conducted in Mbere from September 1972 to February 1974. The first consisted of a detailed study of 36 case-study households carried out from September 1972 to September 1973; the second was the random sample survey of 201 households in Mbere SRDP area carried out from September 1973 to February 1974 referred to above. The pattern of labour allocation in Mbere varies with the seasons, and also with the quantity of rainfall received in a given season. As a result a clear understanding of this pattern can only be derived from household records which cover these different periods as was the case with the case-study survey referred to above.

3. Resource Allocation: Introductory Comments

The income which a person or household receives over a given period is determined predominantly by the way in which they allocate their basic productive resources: land, labour and capital. The ensuing pattern of allocation is a function of the quantity and quality of resources available to each household, the attractive opportunities available for their use and the degree of risk and range of returns associated with each, and the preferences of household members.

3:1. Land

During the period in which the surveys reported in this paper were undertaken land adjudication was being carried out in Mbere. This process was taking several years to complete, and had so far had no conspicuous effect on access to land or farming patterns. Although some of the case - study farmers had had their land adjudicated, none had received their title deeds; and although a few farmers indicated that they expected they would have to move their farms and homes tead as a result of adjudication, none had yet done so.

Land controlled by individual households is used as an input chiefly for farming. However communally controlled bush, and increasingly as land adjudication takes place individually controlled bush, provide crucial inputs for certain other economic activities. Thus the bush provides not only the firewood used by Mbere households, and the wood used for house construction, but also the nourishment for bees,

and the fuel for tobacco production and charcoal manufacture. (Honey selling and charcoal manufacture are wide-spread sources of cash income in Mbere, but flue - cured tobacco production is confined to a limited area.)

3.2 Labour

By most Mbere farmers available labour and not land is seen as the limiting constraint to agricultural production.

For all except a very small minority of farmers in Mbere most of the labour used for farming is family labour supplemented by labour obtained under friendly labour exchange agreements with neighbours and labour supplied by neighbours working in a group in exchange for beer and food. Ability to supplement these labour inputs by hiring, additional permanent or casual labour is a function of the household's stock of working capital, as also is the ability to purchase improved seeds, fertilisers and insecticides. Thus cash outlays for farming are determined largely by the level and regularity of the inflows of cash income to farm households as compared with the outflow of cash required to finance what are perceived to be basic needs such as essential consumption items (sugar, salt, soap, paraffin, food when the harvest fails, etc.)

Unlike land, labour is an essential input into all cash-income earning activities engaged in by Mbere people, and labour is in limited supply for each individual household, Furthermore the need to perform essential housework and loss of labour-time due to ill-health both serve to limit the available supply for income-earning activities.

The term "housework" as used here refers to tasks such as fetching water and firewood, food preparation, cleaning, washing clothes, shopping and going to the market, and repair or construction of household buildings, furniture and utensils. Some households employ young maids, usually aged 12 - 14 years, who help with fetching water and firewood and food - preparation, but their main task is invariably that of looking after small children thus enabling the mother to concentrate more fully on other activities.

The records collected from the case-study households show that a daily average of 3.4 hours of family adult labour-time per household is allocated to housework activities.[1] However this figure becomes much higher during periods of water shortage either during the months prior to the normal advent of the rains or during a prolonged drought. During such periods many Mbere women who are not fortunate enough to live close to a natural or non-made permanent water source may have to spend up to 10 hours walking a long distance to find water and then waiting in a long queue for their turn to draw it. Moreover, even then they may be unlucky and have to return home empty - handed. Such failures have further consequences beyond the need to repeat the search the following day. The records of the case - study households contain references in extreme cases to whole days passed without eating due to lack of water with which to prepare food. This in turn has an adverse effect on available energy and on family health most frequently at precisely the time when labour is required for clearing land and early planting of crops.

The adult labour allocated to housework is normally but not always female. Men living on their own have to perform their own household chores, and where a wife is sick the husband may also help out (e.g. during the final weeks of a difficult pregnancy).

The incidence of ill health in Mbere varies considerably between households but each year every household must expect to lose a certain amount of adult labour time due to resting because of ill - health, visits to the dispensary and caring for sick children. Among the case study - households the average amount of adult labour time lost in such ways by members of the households was 13 days per adult male per year and 24 days per adult female per year. Such losses further restrict the amount of time available for income earning activities.

On average throughout the 12 month study period the amount of labour time allocated per adult per day to farming and to off - farm income earning activities was 3.1 hours and 1.2 hours respectively.

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1. Household size per se appears to have little influence on this average.

Mbere households show an important degree of flexibility in the manner in which they allocate labour to income-earning activities. The main response of Mbere households to the incidence of drought is well illustrated by the daily records of the case-study households. These show that during periods of drought there is a substantial increase in the amount of labour time allocated to off-farm income earning activities by those who do not have regular off-farm occupations. Amongst the case-study households the increase was of the order of 110%, while the allocation of labour time to farming dropped by 118% during the same six month period, April-September 1973, as compared with the preceding six months

3.3. Capital

The form in which most Mbere households most commonly hold their liquid capital apart from small amounts of cash, is in livestock and crops. Farming is usually carried out with the most elementary capital equipment and most of the irregular off-farm income-earning activities which are engaged in require no capital equipment.

Farm inventories were completed for all case-study households and Table 2 summarises the farm equipment owned by 40 households who were taken into the case-study.[1]

Table 2

Mean Ownership of Farm Equipment for 40 Case-Study Households

	Mean	Total
Pangas	2.5	101
Jembes	1.5	60
Digging Sticks	1.25	51
Axes	0.25	10
Shovel	0.15	6
Forks	0.08	3
Mattocks	0.08	3
Wheel barrow	0.05	2

Of all the income earning activities which are engaged in by rural households in Mbere trading followed probably by farming requires more recurrent cash inputs than any other activity, and these must be financed by a stock of liquid capital. That farming, although it falls below trading in terms of the amounts required nonetheless probably ranks second is due to the presence of the agricultural extension service in Mbere and the nature of some of the recommendations made by it. These encourage cash outlays on certain types of seed, fertiliser and insecticide and on supplementary labour. (See below p. 11).

We turn now to consider the characteristics of different income-earning activities with respect to required resources and the returns to land and labour which they generate.

1. Not all of whom, however, remained in the study for the full 12 months.

4. Allocation of Resources in Farming

We have seen that amongst the case-study households the average amount of labour time devoted to farming exceeds that devoted to off-farm income earning activities, and that privately controlled land is used as an input into farming but not for most other income earning activities. We now turn to examine the pattern of resource allocation in agriculture in more detail. We will consider land first.

4.1. Land Use in Agriculture

The case-study households were divided between three different sites located near to Ishiara, Kamugu Village and Kiritiri (see Map 3). At Ishiara, the total cultivated area of ten households was measured in both the 1972/73 short rains and the 1973 long rains. The plot measurements show a drop of 100% in cultivated area between the good season and the bad one. In each of the two seasons land was divided between crops as shown in Table 3.

Table 3

Allocation of Cultivated Land by Ten Households at Ishiara

Crop		Area (Hectares)	%
1972/73 Short-Rains			
Maize and maize/pulse mixtures		4.7300	33.6
Millet and millet mixtures		9.0000	64.0
Sorghum and grams		0.3300	2.4
	Total	14.0600	100.0
1973 Long-Rains			
Maize and maize/pulse mixtures		2.7200	38.9
Millet and millet mixtures		2.1200	30.3
Sorghum and sorghum mixtures (N.B. This was two season sorghum left standing for its second season and not freshly planted)		2.1600	30.8
	Total	6.9900	100.0

The land area cultivated per household at Ishiara in the 1972/73 short rains was 1.4 hectares. This was the largest mean area per household cultivated at any of the three study sites in either season. In this season the mean cultivated area per household varied substantially between the three study sites. On an adult per capita basis the variation is somewhat less, the averages being 0.5859, 0.3686, and 0.5867 hectares at Ishiara, Kamugu and Kiritiri respectively.

In the long-rains the mean newly planted land area per household at Ishiara was little more than 0.5 hectares, most of the land under two season sorghum simply being a carryover of the standing crop from the previous season. At Kamugu and Kiritiri the comparable means were 0.7 hectares and 0.8 hectares respectively.

In Mbere, the short-rains season is traditionally given over predominantly to millet mixtures. The figures for Ishiara given in Table 3 reflect the fact that in Eastern Mbere this traditional pattern continues. In Central and Western Mbere, however greater emphasis is now given to maize in the short-rains season, and this different cultivation pattern is reflected in the land allocation figures for Kamugu and Kiritiri.

Around Ishiara, excluding the area close to the Thuchi river, the land is stony and scattered with rocky outcrops and the soils are mostly shallow. Fertility drops substantially after the first season of cultivation. However by the time the fertility of fallow land is fully restored (after a period of several years) the bush will normally have regenerated quite densely. Thus the clearing of new land is a time and energy consuming task which normally has to be under taken during a period when the weather is uncomfortably hot for this type of work.

Table 4

Allocation of Cultivated Land by Eleven Households at Kamugu.

Crop	Area (Hectares)	%
1972/73 Short-Rains		
Maize and maize/pulse mixtures	1.8200	20.6
Maize with millet mixtures	3.1000	35.0
Millet mixtures	3.4500	39.0
Pulses	0.2500	2.8
Cotton	0.2300	2.6
	8.8500	100.0
1973 Long-Rains		
Maize/pulse mixtures	7.0400	90.9
Sorghum mixtures	0.3700	4.8
Pulses	0.1000	1.3
Cotton	0.2300	3.0
	7.7400	100.00

Table 5

Allocation of Cultivated Land by Seven Households at Kiritiri

Croo	Area (Hectares)	%
1972/73 Short-Rains		
Maize and maize mixtures, excluding	2.1500	30.6
Maize and finger millet mixtures	0.5900	8.4
Finger millet mixtures	0.4900	7.0
Cotton and cotton mixtures	0.9400	13.4
Millet mixtures	1.9200	27.3
Sorghum mixtures	0.2000	2.8
Pulses	0.7400	10.5
Total	7.0300	100.0
1973 Long-Rains		
Maize and maize/pulse mixtures	4.0400	73.6
Cotton mixtures	0.9400	17.1
Pulses	0.5100	9.3
Total	5.4900	100.0

The allocation of land by case-study households at Kamugu and Kiritiri is shown in Tables 4 and 5. (All households for which plot measurements were made in both seasons are included. Unfortunately two of the households at Nyangwa for which measurements were made in the short-rains dropped out of the study in the following season.) The decline in area cultivated in the 1973 long rains was much lower at Kamugu and Kiritiri than at Ishiara, being 28% at Kiritiri and 15% at Kamugu. The much greater decline in area cultivated at Ishiara reflects a more extreme failure of the rains there than at the other two study sites. The same phenomenon is also reflected in the greater decline in the allocation of labour-time to crop cultivation at Ishiara than at the other two sites in the long-rains season.

It is also notable that whereas at Ishiara the division of land between maize and millet mixtures was fairly even in the 1973 long-rains, at the other two study sites where rainfall expectancy is somewhat higher millet mixtures dropped out of the cropping pattern in the long rains, and more land was given over to maize than in the preceding season.*

The returns to land planted to maize mixtures and to millet mixtures differed markedly at all three study sites as can be seen from Table 6.

Table 6

Returns to Land Planted to Maize Mixtures and Millet Mixtures

(Shillings)

Crop	Ishiara		Kamugu		Kiritiri		Mean
	Return	No. of Observations	Return	No. of Observations	Return	No. of Observations	Return
Maize mixtures	761	13	729	5	661	10	717
Millet mixtures	502	14	654	8	544	5	567

*For the great majority of farmers the maize failed as did all crops on dry land farms at Ishiara.

We will show below that maize mixtures also gave a higher return to labour than did millet mixtures in the 1972/73 short-rains season. Thus it would appear that on economic criteria, given reasonable rainfall and current cultivation practices, maize mixtures are preferable. However, given current dietary preferences and the greater nutritional value of millet it seems desirable to encourage farmers to continue to produce this crop.

Cotton is not grown at all around Ishiara except by two farmers on the small irrigation scheme near the town. Otherwise conditions are unsuitable, being too dry and hot. The crop is grown by only a few farmers in the Kamugu area, but is common around Kiritiri. In 1972/73 it was grown by ten of the case-study farmers. On the basis of eight records for that season and three for the previous year the crop gave a mean return of shs.505/- per hectare, which was lower than that for both maize and millet mixtures.

As stated earlier, limited land availability is not seen by most farmers as the dominant constraint to expanded farm output. If labour, and not land, is seen as the limiting factor in crop production then it is not imperative to maximise returns to land in order to achieve the purely economic objective of maximising returns to scarce resources. Rather, it would be foolish to do so, for under such conditions the value of total output can only be maximised if returns to labour are maximised.

4.2. Labour

Let us now turn to consider in more detail the allocation of labour to crop production. It has already been noted that there is a marked difference in the amount of labour time allocated to farming between good and bad seasons with a mean difference of 118% for 30 case-study households. This figure, however, includes livestock maintenance, land demarcation and some capital improvements for both seasons. If we consider crop cultivation alone the fall in use of labour-time between the first and second seasons of the study was 162%.

Table 7

Allocation of Adult Labour to Farm-work 1972/73 Short Rains and 1973 Long-Rains: 31 Case-Study Households

Farm No.	No. of Adults in Household	1972-73 Short Rains (Good Rainfall) All farm work	1972-73 Short Rains (Good Rainfall) Crop Production only	1973 Long Rains (Drought) All farm work	1973 Long Rains (Drought) Crop Production only
1.	3	2329	1532	2093	1024
2.	2	1071	878	573	493
3.	3	1901	1740	823	314
4.	1	675	675	137	137
5.	4	2958	2930	175	83
6.	2	2093	2035	502	453
7.	2	2299	2221	1000	754
8.	1	951	665	770	44
9.	1	778	778	202	202
10.	5	3863	3452	525	363
12.	2	1456	1289	1255	936
13.	1	986	986	677	677
14.	2	1326	975	1001	593
15.	2	1711	1539	958	840
16.	3	2122	2122	760	760
17.	2	1053	675	268	224
18.	1	893	648	639	349
19.	2	1133	870	978	514
20.	1	526	526	274	170
22.	2	1933	1840	623	405
23.	3	3132	2732	2298	1617
24.	2	1889	1287	1319	493
25.	3	3100	1315	2315	505
26.	1	624	624	297	297
27.	1	905	905	248	248
29.	1	991	991	398	398
30.	1	700	700	170	170
31.	2	1089	929	772	620
		44487	35934	22050	13733
Average decline:				118%	162%

In Table 8 we summarise the allocation of labour time between the two main crop mixtures, i.e. those having maize or millet as the dominant grain and including a few instances of pure stands of each crop. The latter group includes millet dominated mixtures which have maize in them, a fact which should be noted when comparing this table with Table 7 . Amongst the case-study households maize/millet mixtures planted in this short rains season were always dominated by millet. A comparison of Tables 7 and 8 shows that while the area under millet mixtures and maize/millet mixtures exceeded that under maize mixtures by 201% the amount of labour time devoted to the former two mixtures exceeded that devoted to maize mixtures by 262%, the millet mixtures being more labour intensive than maize mixtures.

Table 8

Allocation of Labour Time to Different Crops by Case-Study Households During 1972/73 Short-Rains Season

Crop	Labour Time (per Hectare)	Labour Time (Total)
	Ishiara	(10 households)
Maize and maize/pulse mixtures	1135	4623
Millet and Millet mixtures	1329	9961
	Kamugu	(11 households)
Maize and maize/pulse mixtures	1499	1526
Millet mixtures	1931	8655
	Kitiriri	16 households)
Maize mixtures	787	1737
Millet mixtures	1091	2012
	Average/Hectare	Grand Total
Maize mixtures	1140	7886
millet mixtures	1450	20637

In fact, millet mixtures gave a much lower return to labour as well as to land than did maize mixtures in the 1972/73 short rains season. Maize mixtures gave a mean return per hour of shs.-/79 (33 observations) and millet mixtures shs.-/36 per hour (21 observations).

The prices used for valuing the yields achieved for the various crops grown were the means of price records obtained at fortnightly intervals at Ishiara, Siakago and Kiritiri markets. The output of a crop by a particular household was valued at the mean price recorded at the nearest market over the study period. A list of mean prices for the main crops grown is given in Table 10.

Table 9

Mean Prices for selected Crops sold at Ishiara, Siakago and Kiritiri Markets October 1972-September 1973

	Ishiara	Siakago	Kiritiri
Maize	-/47	-/49	-/45
Bulrush Millet	-/67	-/61	-/65
Sorghum	-/65	-/61	-/65
Beans	-/86	-/79	1/-
Cowpeas	1/08	-/90	-/80
Pigeon Peas	n.a.	1/50	1/12
Green Grams	1/04	1/40 n.a	n.a.

From Table 9 it can be seen that millet was valued at prices which exceeded those / for maize by approximately 34%. Despite this fact millet mixtures gave low returns per hectare and per man-hour. This was for two reasons. Firstly, millet mixtures require higher labour inputs for weeding due to their closer spacing and for scaring due to their great attractiveness to birds. Secondly, maize yields per hectare averaged roughly twice as much as millet yields (see Table 10).

Table 10

Average Yields of Maize and Millet: Short Rains 1972/73

Ishiara		Kamugu		Kiritiri	
Crop	Kilo/Hectare	Crop	K/H	Crop	K/H
Maize (grown alone or mixed with beans: 9 plots)	1620	Maize (pure stand or with beans, cowpeas or finger millet: 11 plots)	1815	Maize (pure stand or inter planted with various crops: 17 plots)	1740
Millet (14 plots 10 interplanted, mainly with cowpeas)	660	Millet (Mainly pure stand: 11 plots)	919	Millet (7 plots 3 of them interplanted)	640

Why millet should have yielded so much better on the Kamugu farms than at the other two study sites is not clear. The data for the individual farms are presented in Appendix 1.

Given the higher nutritional value of millet compared with maize, its popularity in Mbere, and the complete lack of agronomic research on the crop, it seems desirable to initiate research with the objective of learning more about the crop and raising yields. Given the current yield losses of millet due to bird attack combined with the substantial labour input required for scaring one wonders whether it might not be possible to develop a spray or some other counter-measure which would render this crop less attractive to birds. At present labour time of an average value of shs.113/- per hectare per season (valued at shs.-/40 per hour) is committed to scaring predators off the millet mixtures. While some of this is child labour a substantial proportion is provided by adults who could be engaged in other income earning activities, while ideally the children should be in school.

This constitutes approximately 32% of the total labour input per hectare for millet mixtures.

In terms of return per hour cotton gave results quite similar to those for millet. For cotton planted in pure-stand the mean return was shs.-/37 (4 observations). For cotton planted either pure stand or mixed the mean return to labour working on the plot as a whole over two seasons was shs.-/41 (6 observations).[1]

It is a well-noted fact that the time flow of required labour-inputs into different farm enterprises is of key importance in determining the optimal enterprise mix on a given farm. Labour available in September cannot be used two months later, and vice versa. If the required inflow of labour were at a constant rate per week or month for all enterprises there would be no problem, but the flow of labour requirements varies both between crops and for a given crop over the production cycle. For this reason in Tables 11 and 12 we summarise the mean labour inputs to the two dominant crop mixtures over the production cycle. These data are based on a good rainfall season (short-rains 1972/73). The following season was so bad that most farmers harvested nothing, and consequently a comparable table could not be prepared.

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1. The cotton returns were obtained over two seasons; all other crops except pigeon peas gave zero yields on most plots in the second of the two seasons.

Table 11 IDS/WP 180

Mean Time-Flow of Labour Inputs into Production of Millet Mixtures: Short Rains 1972/73

Study Site LAND	CROP	CLEAR-ING	DATE	PLANT-ING	DATE	WEED-ING	DATE	SCAR-ING	DATE	HARVEST-ING	DATE	THRESH-ING	DATE
1 Hectare	Millet Mixture												
Ishiara		220		94		414		433		137		125	
Kamugu		167		99		325		431		252		157	
Kiritiri		93		75		288		365		169		111	
Overal Average		160	July-September	89	2nd half Sept. and all Oct.	442	1st weeding November 2nd weeding December	473	2nd half Sept. & all Oct. and Dec-Feb	186	Jan.2, Feb.1	131	Feb-March

Table 12

Mean Time-Flow of Labour Inputs into Production of

Study Site	LAND	CROP	CLEAR-ING	DATE	PLANT-ING	DATE
Ishiara	1 Hectare	Maize	193		85	
Kamugu		Mixture	154		64	
Kiritiri			77		66	
Overall Average			141	July-Sept	72	2nd half Sept & all Oct

Maize Mixtures: Short Rains 1972/73

WEED-ING	DATE	SCAR-ING	DATE	HARVEST-ING	DATE	THRESH-ING	DATE
275		385		127		70	
724		345		148		84	
339		60		142		62	
			2nd half Sept & all Oct. & Dec-Feb				
441	1st Weeding November 2nd weeding December	283		139	Feb 1-March 1	66	When needed

In these and other tables giving total hours worked or returns per hour as opposed to returns per hour of adult labour only, child labour has been converted on the bases outlined in Table 13.

Table 13

Child Labour Conversion Rates

Young children	(pre-teens)	1 hour = $\frac{1}{2}$ of an adult hour (all tasks)
Older children		1 hour = $\frac{2}{3}$ of an adult hour (scaring)
		1 hour = $\frac{1}{2}$ of an adult hour (other tasks)

The timing of labour inputs for weeding scaring and harvesting is partly a function of the timing of planting. Late planted crops will require later weeding, etc. Labour inputs into planting itself can be staggered by those who have the resources to do so by use of dry-planting.[1] Dry planting may be initiated early in September but for the most part a appears to be carried out in the second half of the month and in October prior to the advent of the rains. Late planting may also continue into early November, but again this is unusual. Late October and early November are also used for replanting in areas which have failed to germinate satisfactorily, by those who have the time and seed to replant.

The first weeding of short-rains crops is carried out in November and the second usually in December but the more precise point in the month at which these activities are carried out is a function of the timing of planting and of the advent of the rains.

The exact timing of the advent of the rains in Mbere is uncertain for both cropping seasons. Furthermore, as was suggested in an earlier paper, the appropriate timing of planting in relation to the advent of the rains varies between households, being a function of the overall pattern of economic activity, the economic status, and the immediate economic needs of each household. For these reasons no attempt is made here to identify precise times in the calendar at which certain agricultural activities ought, from the point of view of economic optimality, to take place.

The households both in the case-study groups and the random sample survey identified the periods of planting and first weeding as those which imposed heaviest demands on the available labour. However, it was observed in the daily records that substantial time was also given to scaring crops. This activity, although it did not impose heavy energy requirements, was seen to require the presence of members of the farm family in the fields for prolonged periods during December and January.

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1. See D.Hunt, "Agricultural Innovation in Mbere", IDS Working Paper No. 159 p.

Both Tables 11 and 12 reveal marked variations between study sites in the mean labour input for certain activities. Those showing major variations are clearing, scaring and weeding. In the case of clearing it appears that the main reason for the discrepancy may be the difference in the nature of the terrain between the three study sites. At Ishiara many of the plots of the case-study farmers were rocky and about 50% of them were also on very steep slopes. As a result, land was not cleared through grazing to the same extent as at Kiritiri.

In addition, the more difficult climate at Ishiara may make for a slower rate of work. Terrain and climate may also largely explain the substantially higher inputs into millet weeding at Ishiara as compared with Kiritiri.

The results for the Kamugu farms show remarkably high labour inputs for most activities. These were farms which were obtaining low returns to labour as a result of the intensity of their cultivation practices. They include several households headed by women whose husbands had regular off farm jobs and who did not appear concerned to maximise returns to labour, and the farm of a "progressive" farmer whose household in the short-rains had four adults all working full-time on the farm, putting into practice a number of extension service recommendations: row-planting of millet and maize, thinning and re-planting and clean-weeding, in addition to intensive scaring. This family are truly wedded to their farm. The only sources of off-farm income of the resident household members are some beehives and up to an hour a day early each morning spent teaching the catechism. But the highly intensive cultivation practices of this family have not made them outstandingly prosperous.

Table 14 lists the returns to labour obtained from all crop production by twenty-three of the case-study households. The table reveals a remarkably high range of returns, from shs.1/07 per hour to shs.0/20 per the first season alone.

Table 14

Returns to Labour Used in Crop Production

Farm No.	Area	137 season	Both seasons taken together
1	Ishiara	-/50	-/44
2	Ishiara	-/52	-/47
3	"	-/89	-/82
4	"	-/36	-/29
5	"	-/57	-/57
6	"	-/32	-/29
6	"	-/66 (adult labour only)	
7	"	-/43	-/37
8	"	-/32	-/30
9	"	-/24	
10	"	-/24	-/22
		-/44	-/40
18	Kiritiri	1/07	-/77
15	"	-/54	-/42
7	"	-/52	-/41
20	"	-/85	-/67
19	"	-/94	-/76
21	"	-/55	-/42 (?)
		-/75	-/52
23	Kamugu	-/35	-/25
24	"	-/53	-/39
25	"	-/20	-/12
26	"	-/40	-/27
27	"	-/24	-/19
28	"	-/31	-/13
28	"	-/42 (adult labour only)	
29	"	-/20	-/14
		-/32	-/21

The lower returns to labour achieved achieved at Kamugu as compared with the other two study sites appear to be chiefly a function of the more intensive cultivation of smaller plots per capita at this study site.

The farmers who obtained the highest returns to labour in crop production are those who cultivated their land most extensively. Table 15 illustrates this point further.

Table 15

A COMPARISON OF RETURNS PER HOUR AND PER HECTARE OBTAINED BY CASE-STUDY FARMERS: SHORT RAINS 1972/73: Shillings

FARM NUMBER	CULTIVATED AREA HECTARES	TOTAL VALUE OF OUTPUT NET OF SEED	HOURS WORKED PER HECTARE		RETURN/ HOUR		RETURN/ HECTARE
			Quantity	Rank	Level	Rank	
2	14649	458/60	599	1	-/52	11	311/39
19	14160	816/50	614	2	-/94	2	583/20
3	2.2041	1325/00	974	3	0/89	3	601/20
32	11799	730/=	716	4	-/86	4	819/=
21	0.6259	249/00	727	5	0/55	8	398/=
8	8823	394/30	734	6	1/07	1	787/=
33	8854	629/00	793	7	-/78	6	710/=
5	3.0872	1763/12	1009	8	0/57	7	571/10
24	1.0837	680/00	1188	9	0/53	10	632/00
20	0.4271	452-74	1232	10	0/85	5	1060/15
15	12153	820/13	1244	11	-/54	9	674/83
1	1.5362	974/00	1247	12	0/50	12	634'29
4	5120	240/58	1318	13	-/36	15	470/00
26	0.4043	248/10	1534	14	0/40	14	613/70
7	13422	891/40	1537	15	-/43	13	864/13
11	1.0608	460/00	1834	16	0/25	19	415/00
27	0.4608	264/90	1964	17	0/24	20	408/65
23	1.0147	920/00	2042	18	0/35	16	907/00
6	1.7500	1257/00	2253	19	0/32	17	718/00
28	4600	420/85	3049	20	-/31	18	946/=
25	0.3614	275/00	3639	21	0/20	21	761/=

Table 18 compares for the 21 case-study farmers for whom the data are available the time worked per hectare and the returns obtained per hour and per hectare for the 1972/73 short rains season. With three exceptions (farms numbers 2, 6 and 10) there is a remarkably close inverse correlation between hours worked per hectare and the return per hour. The anomalous result for the first farm (number 2) derives from the fact that this farmer planted most of his farm to millet and obtained an exceptionally low yield from this crop (360 kilos per hectare compared with a mean for his area, Ishiara, of 660 kilos per hectare). In contrast farms numbers 19, 3 and 18 which obtained the highest returns per man-hour used a greater proportion of their land for maize. Farm number 2 experienced particular problems in this season since the wife experienced a difficult pregnancy which prevented her from doing farm-work during October, November and December. In the case of farm number 10 the yield estimates are remarkably high, and unfortunately for this farm there is a possibility that they may not be completely accurate. If we drop these two farms from our calculations and compute a rank correlation coefficient for the remaining 19 farms, inversely relating hours worked per hectare to return per man-hour we get $r = 0.361$ which is close to 0.388, the 5 per cent critical value of r for $n = 19$.

This result is important, for it strongly suggests that given existing man-land ratios in Mbere the extension service has overemphasised the importance of intensive cultivation techniques.

Although the first weeding is seen as imposing heavy demands on available labour, Table 18 shows quite convincingly that in fact under present conditions it pays to cultivate more land less intensively rather than putting a great deal of labour into achieving high cultivation standards on a small scale.

Amongst the case-study households was one farmer to whom the writer had been introduced on a preliminary visit to Mbere as a model farmer. As stated above, this farmer (number 23) applied high inputs of labour per hectare and obtained remarkably low returns per hour worked. He had adopted a number of key recommendations of the extension service: he early planted, grew cotton, row-planted, and weeded intensively. Others, who spread their labour resources over a wider area did better.

These results suggest that if under present conditions of relative resource availability, Mbere farmers were to try to maximise returns to labour by opening more land the pattern of peak labour demand might change. Instead of experiencing the highest demand for labour energy inputs during planting and first weeding, increased pressure

on available time and energy might also be experienced during the period in which land is cleared prior to planting.

Farming in Mbere consists not only of crop production, but also of livestock production. Let as now examine the allocation of labour time to this enterprise and the returns obtained. Table 16 summarises the mean amount of labour time devoted to livestock enterprises by those case-study households who owned stock during each of the two seasons of the survey.

Unless herding is shared between households it is necessary to have a large herd before the regular allocation of adult labour time to herding can be justified by the annual value of the output obtained.

Table 16

RETURNS TO LIVESTOCK PRODUCTION

Farm No.	Herd Size (Oct 1972) Cattle	Herd Size (Oct 1972) Goats and Sheep	Adult Labour Hours Over 12 Months	Child Labour Hours Over 12 Months F=Family H=Hired	Total Value of Production Prior to Deduction on Labour Costs	Total Value of Production Net of Hired Labour	Return per Hour Family Adult Labour Only	Return per Hour Total Labour
2	1	9	106	3155(F)	443/=	443/=	4/18	-/14
3	0	13	569	1184(F)	332/=	332/=	-/58	-/19
6	11	5	140	2900(H)	580/=	388/=	2/78	
7	0	12	155	623	223/=	223/=	1/44	-/29
21	0	1	208	0	100/=	100/=	-/48	-/48
14	0	4	73	276(F)	250/=	250/=	3/42	-/72
18	0	4	463	281(F)	118/=	118/=	-/25	-/16
17	8	3	572	0	420/=	420/=	-/73	-/73
22*	0	8	1081	0	1752/=	1752/=	1/62	1/62
24*	0	11	1158	1447(F)	1400/=	1400/=	1/21	-/64
25	10	19	3101	0	592/=	592/=	-/20	-/20
Mean							1/54	-/46

*Received dowry during year.

We can see from this table that the actual returns to livestock production are highly varied. Generally speaking, if child family labour is considered to be cost free the returns to livestock production are attractive, but if we consider the returns to the total labour time devoted to livestock maintenance, the returns for five of the eleven households are notably low. With one exception the high returns to adult labour time in livestock production were achieved by households who either started with reasonably

large herds and relied predominantly on child labour or tethering or by families who experienced substantial increases in herd size due to dowry payments. Particularly notable are the low returns achieved by the last family in the table. The data for this family show that even where the herd is quite large a traditional livestock enterprise in Mbere cannot offer an attractive return to an adult member of the family working full-time with the herd.

If very few animals are owned it may be possible to reduce labour inputs by tethering, or by having children or the family or child employees do much of the herding. Some of the more affluent households employed child labour specifically for this purpose at rates of shs.15/= to shs.16/= per month.

The returns to livestock production consist of milk yields, stock consumed or sold and appreciation of the herd.

The returns to adult family labour employed in livestock production compare favourably with those obtained in crop production but this result is heavily dependant on the degree of family child labour or low-cost hired labour employed in herding.

For most farmers in Mbere the only inputs used for crop production other than land and family labour are traditional tools and the seeds which they plant. Livestock manure is applied to a very small proportion of cultivated land by a small proportion of stock owners. Occasionally a household may prepare food and/or beer and call some neighbours to help with weeding or threshing, but these are rare occasions for most families, happening usually not more than two or three times per season.

The tools used for farming consist chiefly of jembes (hoes) and digging sticks (worn-down panga blades attached to wooden handles of varying lengths), and pangas and axes for clearing bush. These tools are quite durable, and only a minimal annual cash outlay is required to maintain the tool stock.

Seeds are traditionally taken from the previous season's harvest. After a drought, however, some may have to be bought if sufficient cannot be obtained in the form of gifts or loans from friends and relatives.

Thus it can be seen that the working capital requirements of the traditional farming system are minimal, and that the cash requirements are lower still, although unhappily the latter are invariably highest during periods of shortage following a crop failure. The total working capital requirements of the present pattern of farming in Mbere have mostly been created by the agricultural extension service. These include:

	shs/Hectare
Katumani maize seed	44-50
Fertiliser for Katumani	186-00
Insecticide for Katumani	47-00
Cotton seed	12-00
Insecticide for cotton	186-00
Dip cattle weekly	0 - 10 to 0-20 per head

Table 17 summarises the actual cash expenditure on farming by the case-study households during the year of the survey.

Table 17

Cash Outlays on Crop Production October 1972 - September 1973 (Shillings)

Farm Number	Seed	Labour hire	Livestock Maintenance	Livestock acquisition	Other
1	5-75	0	0	0	0
2	4-45	0	4.00	140-00	0
3	2-00	0	0	0	0
4	5-50	0	0	0	0
5	26-00	40-00	0	0	0
6	5-75	129-00	190-00	0	0
7	4-00	0	0	0	0
8	0-95	0	0	0	0
9	2-00	0	0	0	0
10	3-50	0	0	0	0
15	4-00	0	0	0	0
16	28-50	0	0	0	0
17	10-50	0	0	0	0
18	16-80	14-00	0	0	0
19	5-50	0	0	0	0
20	10-30	0	0	0	0
25	12-00	7-00	9-00	0	50-00
27	1-00	8-00	0	0	0
28	5-50	0	0	0	0

Farm Number	Seed	Labour hire	Livestock maintenance	Livestock acquisition	Other
29	0-00	0	0	0	0
30	5-00	0	0	0	0
31	2-00	0	0	0	0
32	0-00	41-00	0	400	0
33	0-00	24-00	0	400	0
34	30-00	1130/-	0	0	0
35	5-00	0	0	0	0
Average expenditure on seed	8-00				

6. Off-farm Income

We now turn to examine the returns earned by Mbere people employed in off-farm income earning activities. 20% of household heads among the families covered by the random sample survey were in full-time employment, working in jobs most of which were located outside Mbere. The occupations which they were engaged in are listed in Table 18. A further 10% were self-employed in full-time off-farm work in Mbere. These occupations are also listed in Table 18.

Allocation of labour-time to off-farm income-earning activities in Mbere varies between households and also according to the season. In the random sample survey it was found that in 30% of the households interviewed the adult male who was the head of the household had a full-time off-farm occupation. Among the remaining 70% of households most adult men and women would engage in off-farm income earning activities at certain times of the year.

Table IX

Full-time Off-Farm Employment of Mbere Household Heads

A Not Self-Employed		Monthly salaries (average given where more than one) Shs.
Teaching	8	480-00
Nairobi City Council	5	270-00
Clerk	2	n.a.
Driver	2	358-00
Watchman	2	325-00
House servant	2	n.a.
Ministry of Works	2	n.a.
Army	2	180-00
Police	2	750-00
Farm Labourer	2	1200/- and 305/-
Telegraphist	1	70-00
Hospital employee	1	235-00
Survey Department	1	n.a
Agricultural Officer	1	460-00
Civil Servant (type unspecified)	1	n.a.
Mombasa Municipal Council	1	n.a.
Industrial worker (type Unspecified)	1	n.a.
Tarmac making	1	250-00
Evangelist	1	n.a.
Herdsman	1	55-00
Prospecting	1	100-00
	40	Mean = 294-00

B Self-employed		
Shop-keeper	6	
Trader, Mombasa	1	
Selling sand	1	
House plastering	1	
Butcher	1	
Blacksmith	1	
Canteen salesman	1	
Beer seller	1	
Tailor	1	
Self-employed (unspecified)	6	
Sub-total	21	
Total	61	= 30% of household heads

Probably 20 of the 61 occupations listed in Table 18 required at least a full primary education.

In Mbere the chance of attaining employment requiring at least a CPE certificate is still restricted to a small minority of household heads. According to the survey results only 8 (4%) of the 206 household heads had received any secondary education, and only a further 31 (15%) had experience of education in the range from Primary 5 to the end of Primary, and not all of these completed the course.

The great majority of Mbere households derive part of their income from farming. Only 11 (5%) of the respondents to the random sample survey stated their households derived no income at all from crop cultivation. (Half of this group were old people). However, as stated earlier, it is normal practice in Mbere to exploit other sources of income as well as farming. Let us now consider the sources of off-farm income exploited by those who are not engaged in full-time off-farm employment. These are listed in Table 19.

Table 19

Sources of Off-farm Income Exploited in Mbere by those who are not Engaged In Full-Time Off-farm Work.

Farm labouring
Livestock trading
Crop trading
Selling honey
Selling charcoal
Selling sisal
Selling thatching grass
Selling firewood
Selling sisal strings
Hiring out oxen
Blacksmith
Witchraft
Selling sand and stones
Tailoring
Carpentry
Selling water
Working in a hotel/bar/canteen
Working at a maize mill

Selling gruel
Selling mandasi
Selling traditional baskets
Beer-making
Making clay pots
Repairing gourds
Teaching catechism
From shares
Working on SRDP water trench construction

Most but not all of the activities listed in Table 19 were engaged in by members of the case-study group, and for some of these activities it has been possible to estimate returns per hour. These are listed in Table 20.

Table 20

Returns to Off-farm Income-earning Activities Engaged in by Mbere Adults Without Full-time Off-farm Employment

Activity		Return/hour*
Livestock trading	men only	0 up to 1/=
Maintaining beehives	" "	0 up to 2/=
Making and selling charcoal	" "	-/31 - -/80 Mean = -/66
Cutting and selling sisal	" "	-/71
Working in quarry		-/75
House-building	" "	-/80
Working sugar cane press at a bar	" "	-/95
Working on SRDP water trench	" "	1/-
Tailoring	men and women	1/20
Farm labouring in Upper Embu or Mbere	" " "	-/40
Making and selling beer	" " "	-/46
Crop trading	Women only	0 up to 1/-
Selling mandasi and gruel	" "	-/20 - -/70 Mean = -/50
Collecting and selling firewood	" "	-/25
Collecting and selling thatching grass	" "	-/21
Making and selling sisal strings	" "	-/16

*Where one figure only is given this represents an average for all observations.

It can be seen that the range of returns earned was wide: from less than -/20 per hour to about Shs.2/-, with women generally earning less than men.

For some of the enterprises listed in Table 20 the range of returns obtained was so great that it was considered advisable to indicate the maximum and minimum return as well as the mean. Where a wide range of returns may be earned from an activity it, like farming, becomes something of a gamble. This applies in particular to crop trading. While the social pay-offs to trading are often referred to in the literature (many women enjoy the social intercourse of the market place) this other aspect is not. Success in trading appears to be a function of both skill and chance. Skill is involved in knowing when and where to trade which crops, but even the sound trader may be unlucky and find the market glutted when she wishes to sell or vice versa. Thus the case-study households included a woman who persistently did badly in trading and one who fairly consistently did better than the average, but even the latter experienced a wide range of returns including the occasional loss.

Computation of the exact returns to crop trading was rendered more difficult by the fact that unsold produce may be consumed at home. In such cases this produce should be weighed and appropriately valued in order to obtain a true estimate of the returns obtained, but it was not possible to do this in the study reported here.

Livestock trading also carries the risk of loss. An unwise or unlucky trader may find himself saddled with stock for several weeks which he is unable to dispose of at a satisfactory price and of course in this case there is also a disease risk.

Again making and selling mandasi or gruel on market days also offers uncertain returns unless a woman can build a popular reputation for her wares. If a woman can establish a fairly stable outlet for cooked foods at a market place or at a school she may make a useful cash income from this activity.

In charcoal-making the range of returns obtained appears to be primarily due not to any uncertainty in this activity but to the economies of scale which it offers. While the labour involved in cutting wood may offer little such economy, that involved in looking after the burning charcoal obviously offers substantial scale economies. However these can only be exploited by those who can find a sufficiently large outlet for

their output and/or have adequate storage facilities for the unsold product. An enterprising producer living near to a population centre may also be somewhat hampered by the distance he has to travel to find wood and transport the prepared charcoal. It is clearly an asset to be able to produce the charcoal near to a main road.

Quarry work is usually paid for by piece rates. While shs.-/75 per hour is the mean return recorded, it is possible to earn shs.1/- or slightly more per hour for a higher rate of work.

Of all the possible off-farm income earning activities open to Mbere adults, bee-keeping is undoubtedly the most uncertain.

Hive ownership appears to be concentrated in the three eastern locations of Mbere SRDP area (Evuroro, Mavuria and Nthawa) and to be uncommon in Mbeti Location. On the basis of responses to the random sample survey in Western Evuroro and Mavuria mean hive ownership is in the order of 10 per household (with a range from zero to over 100). Comparable figures are not available for Eastern Evuroro and Nthawa where due to an oversight questions concerning hive ownership were omitted from the early questionnaires, but there is reason to suppose that the results for these two areas would have been similar to those presented. Approximately 56% of households in central and eastern Mbere own hives, but only 30% of these are occupied. Bee-keeping holds the attraction that it is not a labour intensive enterprise and an occupied hive can bring high returns to the labour involved in hive maintenance and in harvesting the honey. However there is a substantial element of chance involved in determining whether a hive is occupied. In 1972 the writer was shown improved hives at Ishiara which had been hung 18 months previously by the extension service and still were not occupied. When the rains fail the number of occupied hives falls, so that only for a fortunate few does bee-keeping provide any income off-set to the losses incurred in crop production. As the bush is cut-back for wood-fuel, charcoal and building material and to open more land for cultivation, so also the bee population declines.

An important distinguishing characteristic of certain of the activities listed in Table 19 is the level of capital required to initiate them. This applies in varying degrees to bee-keeping, livestock and crop trading, selling prepared food, and tailoring. Bee-keeping and tailoring require a stock of fixed capital whereas trading requires liquid capital. In addition tailoring is also dependent on possession of a skill which in Mbere can usually only be learnt through payment for a formal course

or some form of apprenticeship. The amount of capital required to start bee-keeping or trading is variable, depending on the desired scale of activity. However the capital requirement combined with the risk involved in entry into these activities mean that they are not open to the very poor in the same way that certain alternative income earning activities such as farm labouring are. Bee-keeping, however, is somewhat exceptional in this respect in that hives are traditionally passed on from father to son and so some poor households in Mbere do possess hives and some derive a much needed cash revenue from them.

42% of hive owners in the random sample survey reported having harvested some honey during the 12 months prior to the interview. The reported value of the honey harvested ranged from shs.2/- to shs.600/- with a mean of shs.94/-.

6. Total Income and Expenditure per Household

We have now examined the main range of income earning activities exploited by Mbere people. Let us turn briefly to consider the mean total income earned per household, the proportion of income earned or converted into cash and the level and composition of consumption expenditure which this income is used to finance.

Table 21 provides a breakdown of the average monthly expenditure of 28 of the case study households into 14 different categories. It can be seen that expenditure on food takes up 49.8% of total outlays. Clothes take 13.4% and school fees 11.3%.[1] Fees paid by an absent husband have been excluded. 13.8% of expenditure was devoted to miscellaneous items which included payment of a dowry, hiring of three child servants, and regular outlays on soap, paraffin, matches, torch batteries, etc. Given the reputation that Mbere men have in some spheres as heavy drinkers it may be remarked that outlays on alcohol and tobacco are surprisingly low. In fact the incidence of consumption of these items varies enormously between households. By some Mbere households their consumption is regarded as morally wrong and is totally shunned. In other cases they are consumed in moderation; but undoubtedly amongst Mbere men there are some hard drinkers. Two of these feature amongst the csse-study households. Unfortunately it is probable that their beer consumption is underrecorded. However, it should be noted that even if we double estimated outlays on beer and tobacco these remain a small proportion of total expenditure. The same is also true of harambee contributions! These also varied considerably between families, and appeared to be a function of three variables: place of residence,

1. These figures were obtained before the introduction of free education for pupils in Primary 1-4.

Table 21

AVERAGE MONTHLY HOUSEHOLD EXPENDITURE OF 25 CASE-STUDY HOUSEHOLDS (Shillings)

	Unprocessed Foods	Processed Foods	Maize Mill	Clothes	Utensils	Furniture	Tax	Fees	Medical	Harambees Church	Trans-port	Alcohol and Tobacco	Other: Specify	Prepared foods
Isiara (6 households)	14-66	19-89	0-21	2-05	0-34	0-08	2-61	2-07	2-03	0-06	0-88	0-11	9-47	00-90
Nyangwa (12 households)	10-13	10-11	0-33	5-22	0-42	0-76	0-00	7-33	2-35	0-21	7-03	0-39	5.43	0-75
Kaugu (6 households)	12-88	5-70	0-12	5-69	0-16	0-00	0-00	4-70	0-10	0-18	1-12	0-03	3-39	0-62
Overal Mean	12-55	8-57	0-22	5-99	0-31	0-28	0-57	4-70	1-49	0-16	3-01	0-18	6.10	0-72

economic status and whether the household included school children. A compulsory contribution to Karurumo Village Polytechnic of shs.5/- for every pupil in primary school in Mbere was levied in 1973 and shs.10/- for every child in secondary school. In addition a few contributions to dip construction were recorded near Ishiara and Kamugu but not among the case-study households near Kiritiri who lived near a recently completed dip. With the exception of outlays on processed foods (predominantly sugar and Jogoo flour, and also cooking oil, tea etc.) and on household utensils and the regular miscellaneous household expenditures such as soap and paraffin and tax payments the expenditures recorded were predominantly for goods and services produced within Embu District. These include unprocessed foods, prepared foods (snacks and meals), use of the maize mill, clothes, furniture, transport with the exception of trips outside Embu (mainly to Nairobi), employment of servants, harambee, and education. This latter item, as well as medical care, is more difficult to classify since both use skills and inputs produced outside Mbere in order to provide the required services. Leaving these two items aside as well as 25% of transport expenditure and 50% of miscellaneous expenditure we find that approximately 69% of expenditure of Mbere households is probably on items produced in Embu district.

The use of a high proportion of total expenditure for the purchase of locally produced goods and services is characteristic of very low income relatively isolated rural communities. It is also a characteristic which in present conditions of labour surplus it would be desirable to develop by developing and diversifying local production to meet local needs.

Analysis of the total incomes of nine of the case-study households shows (summarised in Table 23B)that 58% of their total income over the 12 months of the study was obtained in kind and 42% in cash. 37.4% of total income represented income from activities other than farming (both crop and livestock enterprises).

Analysis of the expenditure patterns of the same households shows that 11% of total cash outlays were on farming while the rest were devoted to household expenditure. The same analysis also shows that none of the households saved any cash during the study period.[1] Net capital formation by the 9 households consisted in the purchase of a young cow (shs.142/-), the purchase of a grain store (shs.50/-) the labour time devoted to boundary demarcation, and the construction of a few farm-buildings (shelters for animals, granaries, and shelters for humans while sharing crops.)

1. Given the sequence of good harvest followed by crop failure this was probably typical of the 20% of Mbere households who did not have a household head engaged in full-time off-farm employment.

Table 22B

EARNED INCOME AND EXPENDITURE

Household Number	Total Income Shs	INCOME IN KIND		CASH INCOME			Consumption Expenditure Shs.	Farm Expenditure on capital and overheads Shs.	Farm Expenditure on casual labour Shs.
		Source	Shs.	Source	Shs.	% of total Income			
1 (1M+1F)	1262/-	C	975/-	O-I	287/-	22.7	all cash income	0	0
2 (1M+1F)	1351/-	C	487/-	O-I	426/-	31.5	397	142/- (cow)	0
		L/S	328/-	L/S	115/-				
		B/H	15	T	541/-	40.0			
		T	810/-						
3 3 (1M+2F)	2463/-	C	1320/-	O-I	811/-	32.9	all cash income	0	0
		L/S	282/-	L/S	50/-				
		T	1602/-	T	861/-	35.0			
4 (1F)	523/-	C	241/-	O-I	282/-	53.9	all cash income	0	0
6 (1M+1f)	3344/-	C	1237/-	C	29/-				
		L/S	427/-	L/S	152/-				
		T	1664/-	O-I	1463/-	43.0	1365/-	192/- (herdboy)	123/-
				B-H	138/-				
				T	1680/-	50.2			
7 (1M+1F)	1603/-	C	891/-	O-I	259/-	18.0	all cash income	0	0
		L/S	233/-						
		T	1124/-						
22 (1F)	745/-	C	410/-	C	29/-				
				O-I	310/-	41.6	all cash income	0	0
				T	335/-	45.0			
30 (2M+1F)	1437/-	C	275/-	O-I	175/-	12.2			
				H	395/-	27.5	815/-	50/-	25/-
		L-S	272/-	L/S	320/-				
		T	547/-	T	890/-	61.9			
31 (1F)	618/-	C	248/-	H	270/-	51.1	260/-	0	0

Key

M = adult male
F = adult female
C = Crop production
L-S = Livestock
O-I = Off-farm income
B-H = Bee-hives
T = Total

For 30 case-study households the mean value of net capital formation during the study period with labour inputs to capital formation valued at shs.-/40 per hour, was shs.50/-. 72% (shs.36/-) of this amount derives from labour time devoted to land demarcation. Land demarcation is for the most part a once for all excercise but it is also highly prolonged, and it is probable that the mean of 90 hours per household recorded as devoted to land demarcation during the year of the study does not fully reflect the average total time per household required for this purpose when land adjudication is taking place in an area. In this respect it should be noted that the time devoted to demarcation consists not only of the time spent clearing and marking boundaries, but also in establishing permanent boundary marks, for example by planting sisal, and in attending land adjudication meetings and court cases (as prosecutor, defendant or witness).

7. The Future

We have seen that Mbere is an area of high risk agriculture where the rains are liable to fail one season in two. Yet it is also the case that the people of Mbere derive in the order of 47% of their incomes from crop production (and another 17% from livestock). Crop production is the most important single source of income for the area, but nonetheless it does not appear to provide more than half the total income earned. At present there is no immediate prospect of incomes from crop production becoming stabilised. Yet in an area such as Mbere where the absolute level of incomes and savings is low a degree of stability in income flows is essential. It is for this reason that we find people switching so quickly and substantially into off-farm income earning activities when it becomes apparent that the rains have failed.

It is evident that given the proportion of labour time devoted to off-farm income earning activities, the reason for this distribution of time, the poor prospects even in the medium term for any really marked increases in labour productivity in farming, and the present approximate rate of population growth in the area, it is essential that all possible opportunities for increasing incomes from non-farming activities be investigated. Some of these activities must invariably compete with farming in their demand for resources while others need not necessarily do so.

One activity which is competitive for resources - both land and labour is charcoal production. The range of returns per man-hour obtained for charcoal production by members of the case-study households was shs.-/31 to shs.-/80 per man-hour. As stated above the range of returns obtained appears to be at least partly a function of the scope for obtaining economies

of scale which in turn is largely a function of location. The data collected in the course of the study did not permit any estimate of the returns to land obtainable from charcoal production. However data are presented in H.A. Luning's report for the Kenya Soil Survey Project.[1]

Luning cites a report which gives figures for charcoal production in Rift Valley Province. He states that:

"Moderately dense Tarchonanthus yielded 74 bags of charcoal per ha., worth shs.250/-, but all depends on tree density per ha. In commiphora bush, yields of 150-250 bags/ha were obtained, but in this case charcoal burning was linked to a bush clearing programme."[2]

Map 3 shows that Mbere SRDP area consists of combretum savannah and combretum accacia in the western half and accacia commiphora in the eastern half. If the yield figures which Luning cites for accacia commiphora are at all representative for this ecological zone one would expect them also to apply to much of Mbere.

At a price of shs.7/- per bag a yield of 150 bags per hectare gives a return per hectare of shs.1050/- which appears considerably higher than the mean return per hectare obtained from crop production. The problem however is, as Luning states, that no data appears to be available on the length of the recovery period which determines how long a charcoal burner must wait before being able to cut the same area again.

Thus charcoal offers an attractive alternative to crop production in terms of the return per hour (cf Table 15) and the further attraction that it is not dependant on the weather. However, the return per hectare is not known. In addition, indiscriminate cutting of bush causes serious soil erosion. In view of these uncertainties and the conflicting demand for resources / used in charcoal production it seems highly desirable that a controlled project of charcoal production designed primarily to obtain estimates of yields, bush regeneration periods and the cost and time involved in replanting cut areas as opposed to waiting for regeneration. Once this data has been obtained it should be possible to determine more precisely the areas in which and the extent to which charcoal production should be

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1. H.A. Luning, Land Utilization Types of the Medium Potential Areas of Eastern Province, Kenya, Republic of Kenya Ministry of Agriculture, 1973, p.41.

2. Luning op.cit.; data taken by Luning from E.C.S. Little, Kenya Bush Control, UNDP/FAO. Nairobi, 1972.

encouraged in Mbere. If any areas can be identified where production can be concentrated then it should be possible to obtain economies of scale both in production and in transport of the finished product.

Skilled activities which in the future will become of increased importance in Mbere include masonry, mechanics and carpentry. Karurumo Village Polytechnic and Siakago Mission Carpentry school are already producing people with these skills, and at present the graduates are experiencing some difficulty in finding work within Mbere itself. There does not appear to be any economic justification for a major expansion of the intake into these training course either at present, or until there has been a significant increase in demand for the services of such people. Such an increase in demand could arise either from a general increase in incomes in the area or from the identification of other products which might be produced in particular by the carpenters which would meet already felt needs. In the future it might also be worth considering the addition to the basic carpentry course of instruction in elementary decorative work - both carving and painting in order to tap a wider market.

It can be seen from Table 21 that the mean return to off-farm income earning activities engaged in by men is considerably higher than that obtained by women. Hence it constitutes an apparently rational allocation of resources in households where husband and wife are both present for the husband to spend more time engaged in such activities than the wife, and this was quite often observed to be the case. However women whose husbands are absent, who are wideowed or whose husbands are sick or otherwise undependable also have a particular need for income from such sources and in all households off-farm income earned can make an important addition to total income - especially during droughts.

An activity which may offer considerable opportunities for diversification and expansion in Mbere is the production of women's handicrafts. The daily labour use records of the case-study households did not produce good input-output data for these for two reasons: firstly, during the day this work is usually done in conjuction with another, dominant, activity, e.g. walking to market selling goods at the market, minding children, scaring crops etc., and it is these latter activities which were recorded. Secondly work on handicrafts is also quite often done after sunset. At present the handicrafts produced consist predominantly of baskets of various sizes made from sisal or purchased artificial fibres which are kept in the household or used locally and are used primarily for transport of goods and crops, for crop storage and as "handbags". Discussions with

various people have generated several suggestions as to ways in which handicraft production might be diversified. One suggestion was that it might be possible to diversify into the production of sisal matting which would be made in the /manner of Hanoi rush matting, i.e. in small squares (9" x 9" or 12" x 12") which would be easily transportable and could subsequently be sown together to make mats of varying sizes. It should also be noted that Embu has for many years had a high-class tourist hotel which would be an obvious outlet for local handicrafts. At present the hotel does not run a tourist shop; nor is there such a shop in the town itself.

Examination of the various activities listed in Table 21 unhappily does not lead to the identification of many offering major opportunities for expansion. Sisal cutting may be expected to fluctuate in response to variations in sisal prices as has been the case in the past. Small-scale tailoring (operation of a single sewing-machine usually at a shop-front) is already established in Mbere. This activity may be expected to expand as demand for school-uniforms and other clothing grows but it will have to do so in competition with ready-mades which mostly supoly the better quality section of the market. If the reduction in the area under bush can be halted it may be possible to achieve some increase in honey production, but it should be remembered that this like agriculture can be expected to manifest seasonal fluctuations in response to variations in rainfall. Other of the better paying activities such as house-building and working at bars and selling prepared foods may also be expected to grow initially as incomes grow, but like tailoring these activities cannot be expected to constitute dynamic sources of growth.

Given the lack of potential for dynamic growth amongst most of the off-farm income earning activities currently engaged in it is imperative to investigate the growth possibilities of those which do show some possible promise such as handicrafts and charcoal, both of which can be exported from the district and do not only face a limited local market, and it is equally imperative to investigate possibilities for production of new products. Two such products which have been suggested are firstly ox-drawn implements/for crop cultivation and secondly large "Ali-Baba" jars made of a clay/cement mixture which may be used for storing both water (in substitution for costly corrugated iron tanks) and crops. Prof. Johnston's current research is concerned with an investigation of the potential for the former, while the latter have been suggested by a recent Australian aid mission to Kenya's medium potential areas. The jars are currently made and used in Thailand. Their manufacture would use in part local materials and would develop already existent local skills in clay-pot making. Given the important

impact which water scarcity has on the use of labour time, health and also school attendance in Mbere it is to be hoped that the possibility of introducing production of these jars in Mbere will be carefully investigated. The mission members have suggested that the appropriate method of introduction would probably be to bring one or two Thai potters to Kenya for a few months and to establish them in a previously selected community within the medium potential areas where they might set up production and test the attractiveness of the storage jars to local households - if they prove attractive at the price which would be required to cover production costs, then the same potters could train a nucleus of local potters.

In the first instance use of the jars for water collection would be confined to those with at least some corrugated iron roofing. However, it is possible that clay tiles might be developed as a locally produced substitute for corrugated iron. In the meanwhile, on this basis of the r random sample survey results it appears that approximately 18% of Mbere households own at least some corrugated iron roofing.

Conclusion

In an earlier paper a few suggestions were made as to innovations which might be investigated or encouraged in the forestry, tree-crop, and agricultural sectors in Mbere - primarily the first two.[1] In addition it was suggested that further improvements in the water supply are urgently needed, and even if an innovation on the lines of the clay/cement storage jars were introduced it seems clear that extension of the SRDP pipe-line to serve a wider area is also highly desirable, primarily to serve those with no storage facilities. Construction of the trench for the pipe-line also creates local employment. In this paper we have referred tentatively primarily to two innovations in the fields of charcoal and handicraft production, as well as to water storage. The list is not long, but it is to be hoped that the difficulty of devising a longer, but also realistic, list is an indication of the urgency of the situation.

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1. See Hunt op.cit.

With the yield levels currently attained even in a good season, and with the current ranges of farm-size, it is impossible to see farm production as a dynamic source of economic growth in Mbere. Any hope that it may become such is based either on a faith in the unknown; i.e. the hope that once agronomists in Kenya begin to give their attention to the medium potential areas they will identify certain growth-inducing innovations. I have argued in this paper that most traditional off-farm income earning activities also cannot be expected to constitute dynamic sources of growth. What is needed is an intensive search for potentially dynamic sub-sectors in both these fields.

Appendix 1

Average Millet Yields for Individual Plots: Short-Rains 1972/73.

Farm Number	Maize	Beans	C/Peas	G. Grams	1 Season Sorghum	Bulrush millet	2 Season Sorghum	Pigeon Peas
11			0			701		
5 2nd Plot	192					842		
4			31			557	0	0
2 1st Plot			0			358	0	0
1			0			880	0	
3			50		190	260	0	
2 2nd Plot			0			359		
8		0				800		
7 1st Plot	355				216	568		
7 2nd Plot	442		160		96	373	0	
5 1st Plot						1159	0	
5 1st Plot totally unweeded						140		
9						795	0	0
6 1st Plot						812		
6 and Plot						573		

B. Kamugu

Farm Number	Maize	Cowpeas	Bulrush Millet
26	0		897
29	580		870
23			1100
35			1330
36			445
33			1420
28			1380
25			1267
37			890
27			570
30		200	390

C. Kiritiri

Farm Number	Maize	1 Season Sorghum	Beans	Bulrush illet
15	-	-	-	710
16	720	-	-	660
17 1st Plot	-	-	-	1100
17 2nd Plot	80	150	-	340
18	-	-	-	1080
21	-	-	-	400