

WHY AND HOW TO RECLAIM ZONES 4 AND 5 FARMS

G-C.M. MUTISO
MUTICON

PERMANENT MIGRATION TO ASALS

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

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

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

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

		%R/EO Area (Km2)	% Country area
Zone IV	Semi-humid	40-50 27 000	5
Zone V	Semi-arid	25-40 87 000	15
Zone VI	Arid	15-20 126 000	22
Zone VII	Very arid	15 226 000	46
Total		506 000	88

Source: Farm Management Handbook of Kenya

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

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

In the last ninety years, the populations in ASAL districts have moved from the more humid

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

Table 2
ASAL DISTRICTS CLASSIFIED BY DEGREE OF ARIDITY

Category	Districts	% Total ASAL area
A. 100% ASAL	Isiolo, Marsabit, Garissa, Mandera, Wajir, Turkana	62
B. 85-100% ASAL	Kitui, Tana-River, Taita-Taveta Kajiado, Samburu	25
C. 50-85% ASAL	Embu, Meru, Machakos, Laikipia, West Pokot, Kilifi, Kwale, Baringo	10
D. 30-50% ASAL	Lamu, Narok, Elgeyo Marakwet	3

Source: IFAD/UNDP, 1988

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

Table 3.
DEMOGRAPHIC INDICATORS BY ASAL DISTRICTS

District	Pop. Size 1989'000	Growth Rate		Net Migration		Rate Per 1,000./89
		1969-79	1979-89	Change	Rate Per	
Garissa	236	+685%	+573%	-112%	+2681	
Laikipia	242	+701%	+573%	-146%	+2276	
West Pokot	281	+662%	+540%	-122%	+1988	
Marsabit	166	+613%	+520%	-093%	+1647	
Lamu	73	+647%	+515%	-132%	+1693	
Tana River	158	+590%	+507%	-083%	+1481	
Kajiado	254	+550%	+506%	-044%	+1349	
Narok	354	+519%	+494%	-025%	+1145	
Wajir	235	+480%	+488%	+0.08%	+1158	
Embu	412	+385%	+418%	+033%	-34	
Machakos	1587	+368%	+411%	+043%	-61	
Isiolo	7	+360%	+398%	+038%	-79	
Kwale	440	+335%	+394%	+059%	-323	
Kilifi	658	+336%	+392%	+056%	-324	
Meru	1264	+330%	+391%	+061%	-361	
Kitui	697	+302%	+376%	+074%	-531	
Taita-Taveta	219	+288%	+367%	+079%	-719	
Baringo	296	+231%	+347%	+116%	-177	
Mandera	141	+110%	+251%	+114%	-2259	
Samburu	102	+095%	+250%	+155%	-2415	
Elgeyo M.	164	-065%	+086%	+121%	-4395	
Turkana	147	-1243%	-020%	-123%	-5385	
Total ASAL	8198	+381%	+398%	+017%	-120	
National Total	23883	+337%	+400%	+063%	0.0	

Source: ASAL Development Policy Paper Draft 3, 1990.

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

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

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

Table 4:
POPULATION DENSITY BY AEZ 1932-1969

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

Source: Lynam

Table 5:
ACTUAL NET POPULATION FLOWS TO AEZ ZONES

	1932-48	1948-63	1963-69
II			
III	0	-17,250	-28363
IV	+11,940	+9,736	+17,170
V	+6,772	+19,973	+75,326
VI	+5,119	+7,036	+17,385
Total	0	0	+47,175

Source: Lynam

Table 6:
PERCENTAGE GROWTH RATES BY AEZ 1932-1969

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

Source: Lynam

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

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

sustainable production techniques for intensification of agricultural production.

ASAL PRODUCTION

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

Table 7
LIVESTOCK POPULATION 1987 ('000)

ASAL Districts	Beef Cattle	Dairy Cattle	Sheep	Goats	Camels	Donkeys
Meru	263	140	106	96		
Machakos	388	34	96	249		
Kitui	304	6	68	535		
Embu	61	37	26	106		
Narok	801	34	436	423	129	
E Marakwet	101	337	137	146		
Baringo		103	49	129	649	1 3
Kajiado		608	2	500	449	12
Laikipia		217	25	297	267	1 1
Kilifi	169	17	23	160		
Lamu	44	4	8	15		
T Taveta		140	9	50	155	
Kwale	223	11	67	131		
T River	444	159	293	52	2	
W Pokot		170	10	190	120	1 1
Marsabit		315	401	425	227	23
Isiolo	203	178	119	424	52	
Turkana		208	720	1080	10	5
Samburu		155	163	253	14	10
Mandera		126	110	714	12	4
Wajir	25	180	220	153	3	
Garissa		693	100	678	61	4
Total ASAL	5761	715	4144	7283	956	249
Total Non ASAL		3310	2287	2300	1245	
ASAL as % of						
Total	64	24	64	85	100	100

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

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

Table 8
ASAL POTENTIAL CROP PRODUCTION

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

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

ASAL LAND SHORTAGE

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

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

District	1969	1979	1989
Narok	7.32	4.30	2.66
Lamu	3.36	1.76	0.98
Laikipia	2.09	1.03	0.55
Kitui	0.89	0.66	0.50
Kwale	0.79	0.57	0.42
Embu	0.58	0.39	0.28
Kilifi	0.53	0.38	0.28
Taita	0.45	0.34	0.26
Machakos	0.40	0.28	0.20

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

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

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

Since adjudication is far from being completed, it will not be possible to establish the actual land holding per household and per capita. If the catchment approach is adopted, data can be collected in the catchments to refine data on farm size and to elucidate variations by zones per capita. For land use planning it is the farm size which will be critical and not the statistical average land holding.

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

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

MAKILA: TRIBULATIONS OF A MIGRANT DEVELOPING A ZONE 5 FARM

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

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

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

Average Rainfall estimate 600mm

60% Reliability of Rainfall Long Rains 200mm

60% Reliability of Rainfall Short Rains 200mm

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

This is all the formal written up data on the region the farm is located. The nearest rainfall gauge is in Wamunyu Chiefs centre 10 kilometres away. It is not to be trusted for often it rains there without a single drop in Makila. Soils have not been analyzed.

1970

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

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

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

1970 Short Rains

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

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

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

1971 Kathano

The farmer approached the local TA for laying out four terraces. One kyambo (25 feet) of terracing 2 feet by 3 feet cost Ksh. 25. These were done in Kathano (short dry period in January/February).

No crops were planted.

1971 Long Rains

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

Sweet potatoes and cassava survived. They were an innovation for nobody else grew them.

The farmer had got the idea from the ALDEV records of Makueni. However, since there was none in the region, he had collected planting material from Kangundo. Somehow they were not adapted to the region and yields were dismal. Vermin had their fill though. There were no family members to watch over the vermin. Employed staff always had arguments that vermin, especially monkeys, were smart and attacked when the staff went for lunch, were looking after cattle and goats, were repairing the fence or sleeping at night. After all employment is a 8-5 affair. It is more so when the owner lives in Nairobi and is a migrant.

The terraces broke.

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

1971 Thanu

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

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

1971 Short Rains

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

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

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

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

1972 Kathano

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

ALDEV TA recommended terracing grazing land for he was convinced that grass would not grow until water was retained. The alternative was to use a chisel plough which he remembered from ALDEV reclamation of Makueni. The farmer had seen such a chisel in the World Bank Baringo Project. It was the only one in the country and had been imported from Argentina. Since that option was closed, four terraces were added in the grazing land. Terracing a kyambo length has gone up to Ksh. 35.

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

1972 Long Rains

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

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

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

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

Thano 1972

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

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

1972 Short Rains

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

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

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

1973 Kathano

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

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

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

1973 Long Rains

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

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

1973 Thano

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

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

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

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

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

1973 Short Rains

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

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

1974 Kathano

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

1974 Long Rains

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

1974 Thano

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

1974 Short Rains

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

1975

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

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

1976 Kathano

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

1976 Long Rains

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

1976 Thano

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

1976 Short Rains

Did not replant oranges for the rain was very poor.

1977 Kathano

Continued to prune trees.

1977 Long Rains

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

1977 Thano

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

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

1977 Short Rains

Concentrated on spraying and cultivation of oranges.

1978 Long Rains

There was very good rain. It started early in March and continued to July. The grass and the

trees look fantastic. The oranges are good at the beginning of the season. The local TA gave us fertiliser for the oranges. We put about five spoonfuls under each tree.

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

1978 Thano

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

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

1978 Short Rains

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

Ten or so orange trees flowered.

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

1979-1990

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

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

The carrying capacity of the land has obviously improved tremendously. Each year, at least 4 head of cattle and 30 small stock are sold, with an average return of about Ksh. 30,000. Given the fact that their management is easier than cropping, the farmer has decided to concentrate on this for given his base, it is not cost effective to be running up and down organising planting, vermin control and weeding. Yet that does not say that one cannot produce a decent crop for subsistence and sale. On the fallow terraced land, Nthata Kivumbu grows to above a metre. The only other place the farmer has seen that growth is in a project in Baringo where it grew up to two metres under a system of road grader microcatchments on silt.

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

woman in Nairobi!

UNRESOLVED ISSUES

1. TREE PRUNING AND MANAGEMENT OF NATURAL GROWTH.

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

2. IMPROVEMENT IN MICROCLIMATE

One of the detail points which is not trapped by the data culled from Jaetzold, the bible in Kenya agriculture, is the localised effect of being in proximity to the Athi River. We mentioned that at times there appears to be localised rain on Makila. Explanations for this range all the way from witchcraft to effects of the moisture from the Athi channel. What is clear is that the vegetation, shrubs, grass and trees, stay green longer on Makila than on other farms adjoining. Temperature is lower during the hot periods. Obviously the trees have an effect. Obviously reforestation with *A. Mellifera*, *A. Tortillis* and *A. Albida* allows other superior native grasses to get on with it enabling the farmer to improve his carrying capacity.

3. LARGE SCALE WATER HARVESTING.

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

4. BUSH CLEARING

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

5. TILLAGE

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

6. THE MAIZE TRAP AND OTHER CROPS

Given the preference on maize, driven by the shortage of labour for scaring birds necessary if one is to grow millet or sorghum, what is the solution? More suitable maize or more water harvesting? The farmer even planted Variety 511 and it did well. The catch is that it was in an area receiving water from the road. Other upland varieties were tried and they did as well as the local varieties and out performed Katumani. Extrapolating on Heyer's research and changes in the 1960's Lynam makes a major point that it was the katumani maize technology which enabled farmers to move into Zone 5 and produce a subsistence crop. Yet all the successful farmers in my location have refused to adopt Katumani. They argue that their own selected seed, based on the Muranatha seed from around 1940, does better, by maturing earlier and producing more as well as tasting better and thereby commanding a better price locally. Katumani needs fertiliser which they argue dries the farm. Is there need to re-evaluate this technology given the problems of fertiliser availability, costs and problems with the soil structure?

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

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

7. SOURCES OF INFORMATION AND TECHNIQUES

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

References

1. Bos, R.A. Thiadens. Report on Water Programme. Development Office of the Catholic Diocese of Machakos, A Project Evaluation.
2. Boserup, Ester. The Conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure. Chicago: Aldine Publishing Company, 1965.
3. Brown, L.H. "Agricultural Change in Kenya: 1945-1960." Food Research Institute Studies, 8 (1968): 33-90.

4. Brown, L.H. A National Cash Crops Policy for Kenya. Nairobi: Government Printer, 1963.
5. Brown, L.H. "The Development of the Semi-Arid Areas of Kenya." Unpublished paper, 1963. (Mimeographed.)
6. Carlioni, Alice, Nadine Horestein, T.J.Njoka, Kuria Mbugua and D.B. Thomas and S.N. Ngui. Interim Evaluation of the Kitui Arid and Semi-Arid Lands Project Phase II.
7. Clayton, E.S. "Mechanization and Employment in East African Agriculture." International Labour Review, 105 (1972).
8. Cone, L.Winston, and Lipscomb, J.F. The History of Kenya Agriculture. Nairobi, Kenya, University of Africa Press, 1972.
9. Critchley, W.R.S. Runoff Harvesting for Crop Production Experience in Kitui District: 1984-1986.
10. Dowker, B.D. "Sorghum and Millet in Machakos District." East African Agricultural and Forestry Journal, 29 (1963): 52-56.
11. Dowker, B.D. "A Note on the Reduction in Yield of Taboran Maize by Late Planting." East African Agricultural and Forestry Journal, 30 (1964): 33-34.
12. Dowker, B.D. "New Cereal Varieties - 1963: Katumani Synthetic No. 2." East African Agricultural and Forestry Journal, 30 (1964): 31-32.
13. Dowker, B.D. "Rainfall Reliability and Maize Yields in Machakos District." East African Agricultural and Forestry Journal, 28 (1963): 134-138.
14. Gardner, W.R. "Soil Water Relations in Arid and Semi-Arid Conditions." In Plant-Water Relationships in Arid and Semi-Arid Conditions. Paris: UNESCO, 1963.
15. Heyer, Judith. "A Survey of Agricultural Development in the Small Farm Areas of Kenya since the 1920's." Working Paper No. 194, Institute for Development Studies, Nairobi, 1974.
16. Hunt, Diana. "Resource Use in a Medium Potential Area: The Mbere Rural Economy." Working Paper No. 180, Institute for Development Studies, Nairobi, 1974.
17. Huxley, Elspeth. A New Earth. London: Chatto and Windus, 1960.
18. International Bank for Reconstruction and Development, Permanent Mission in Eastern Africa. Agricultural Mechanization in East African Countries. IBRD, 1972.
19. International Bank for Reconstruction and Development. "Agricultural Sector Survey - Kenya." Report No. 254a-KE, IBRD, 1973.
20. Kampen, Jacob. "Soil Water Conservation and Management in Farming Systems Research for Semi-Arid Tropics." Unpublished paper, ICRISAT. (Mimeographed.)
21. Kenya Land Commission Evidence. Vol.II. Nairobi: Government Printer, 1933.
22. Kimambo, I. N. "The Economic History of the Kamba, 1850-1950." In Hadith 2. Nairobi: East African Publishing House, 1970.

23. Kisovi, Leonard. M. Rural Settlement and Environmental Problems in Kitui District, Kenya. A Paper presented at the International Association for Impact Assessment Conference on June 24-28, 1989 at Queen Elizabeth Hotel in Montreal, Canada.
24. Lele, Uma. The Design of Rural Development: Lessons from Africa. Baltimore: The John Hopkins University Press, 1975.
25. Lipton, Michael. "The Theory of the Optimizing Peasant." Journal of Development Studies, 4 (1968).
26. Lynam, John K. An Analysis of Population Growth, Technical Change and Risk in Peasant, Semi-Arid Farming System: A Case Study of Machakos District, Kenya. Stanford University Ph. D. Thesis 1978.
27. Mbithi, P.M., and Wisner, B. "Drought and Famine in Kenya: Magnitude and Attempted Solutions." I.D.S Discussion Paper No. 144, University of Nairobi, 1972.
28. Muchiri, G., and Johnston, B.F. "Equipment and Tillage Innovations for Kenya's Medium Potential (Semi- Arid) Farming Regions." In Farm Innovations for Agricultural Development and Rural Industrialization. Occasional Paper No. 16. Nairobi: Institute for Development Studies, 1975.
29. Munro, J. Forbes, Colonial Rule and the Kamba: social Change in the Kenya Highlands 1889-1939. London: OUP. 1975.
30. Mutiso, G-C. M., Kenya: Politics, Policy and Society. Nairobi: EALB. 1976.
31. Ndeti, Kivuto. Elements of Akamba Life. Nairobi: East African Publishing House, 1972.
32. Njoka, Theuri J. Government of Kenya and Louis Berger International, Inc. Kitui District Focus Plan. Range and Livestock Development Proposal.
33. Nooy, E.J.P de. Diocese of Kitui: Handbook for Simple Water-Engineering in Kitui District, Kenya.
34. Ominde, S.H Land and Population Movements in Kenya. Evanston: Northwestern University Press, 1968.
35. Richards, Paul. Indigenous Agricultural Revolution. London: Hutchinson Publishing Group, 1985.
36. Ruthenberg, Hans. Farming Systems in the Tropics. London: Oxford University Press, 1971.
37. Schultz, Theodore. Transforming Traditional Agriculture. New Haven: Yale University Press, 1958.
38. Swynnerton, R.J.M. A Plan to Intensify the Development of African Agriculture in Kenya. Nairobi: Department of Agriculture, 1954.
39. Wilde, John C., de. Experiences with Agricultural Development in Tropical Africa: The Case Studies. Baltimore: The John Hopkins Press, 1967.
40. Wolgin, Jerome M. "Resource Allocation and Risk: A Case Study of Smallholder Agriculture

in Kenya." *American Journal of Agricultural Economics*, 57 (1975): 622-630.

41. Zwanenberg, Roger van. *The Agricultural History of Kenya to 1939*. Nairobi: East African Publishing House, 1972.

Adams, M.E., and Adams, W.M. (unpublished), *Kenya's Arid and Semi-Arid Lands*.

Anonymous (1966), *African Land Development in Kenya, 1946 - 1962*. Ministry of Agriculture, Animal Husbandry and Water Resources.

Annual Agricultural Reports, District. Ministry of Agriculture 1951 - 1979, Kitui District, Kitui.

Bernard, F.E., and A.J. Thom, *Population Pressure and Human Carrying Capacity in Selected Locations of Machakos and Kitui District*. *Journal of Developing Areas* No. 15.

Braun, H.M.H., (1977), *The reliability of the rainy seasons in Machakos and Kitui Districts*. Paper M12, Kenya Soil Survey, Ministry of Agriculture, Nairobi.

Dietz, A.J., and R. van Geuns, (1982), *Het meten van regional vershiellen in markt integratie: Kenia en Tanzania als voorbeelden*. *Ruimte en Politiek* Nr. 2, Nijmegen.

District Development Plan, 1974 - 1978, Kitui, Ministry of Economic Planning and Development, Kitui, 1975.

District Development Plan, 1979 - 1983, Kitui. Ministry of Economic Planning and Development, Kitui, 1980.

District Development Plan, 1989 - 1993, Kitui, Ministry of Economic Planning and Development, Kitui, 1989.

Eastern Province Development Plan, 1966 - 1970. Department of Agriculture, Nairobi, 1966.

Finkel, M. (1990), *Draft Environmental Action Plan for Sustainable Development of ASAL*. MRDASAW, Nairobi.

Finkel, M. (1991), *Evaluation of Waterpoints Constructed by Mutomo Soil and Water Conservation Project*. Kitui Integrated Development Programme, Kitui,

Heyer, J. (1974), *A Survey of Agricultural Development in the Small Farm Areas in Kenya since the 1920's*. IDS, WP 194, Nairobi.

Holmsberg, G., (1990), *An Economic Evaluation of Soil Conservation in Kitui District, Kenya*. In: *Dryland Management Economic Case Studies* (eds. J.A. Dixon, D.E. James, P.B. Sherman). Earthscan Publications Ltd., London.

Kitui District Environmental Assessment Report (1981). Ministry of Environment and Natural Resources.

Kitui District Water Resources Study, Annex H: Environmental review (1982). Ministry of Economic Planning and Development.

Kitui District Socio-cultural Profile (1986). Ministry of Planning and National Development.

Kitui Integrated Development Programme (1989), Plan of Operations, Volumes 1,2, and 3. MRDASAW, Nairobi.

Kitui Integrated Development Programme (1990): Workplan 1990/91, MRDASAW.

Law for Acquisition of Land for Community Institutions and for Managing Community Structures (1991). Mutiso Consultants, Nairobi.

Mutiso, G-C.M., (1977), Kitui, the Ecosystem Integration and Change; an Overall Framework. IDS, WP 303, Nairobi.

Mutiso, G-C.M., (1977), Creation of the Kitui Asomi. IDS. WP 304, Nairobi.

Mutiso, G-C.M., (1977), Kitui Livestock. IDS. WP 305, Nairobi.

Mutiso, G-C.M., (1977), Kitui Trade. IDS. WP 306, Nairobi.

Mutiso, G-C.M., (1977), Kanduti, a Case Study. IDS. WP 307, Nairobi.

O'Leary, M., (1984), The Kitui Akamba, Economic and Social, in Semi-arid Kenya. Heinemann Educational Books, Nairobi/ London.

Pagiola, S., (1990), Preliminary Estimates of the Economics of Soil Conservation in Kenya. Policy Analysis for Rural Development- Report No. 1. Egerton University.

Penwill, D.J., (1951), Kamba Customary Law. Kenya Literature Bureau, Nairobi.

Schellenberger, B., (1981), Op de rand de periferie - Ruimtelijke verschillen in de economische ontwikkeling en de invloed van de overheid daarop in Kitui, Kenya, Sociaal Geografisch Instituut, Universiteit van Amsterdam.

Small Farm Survey, (1978), Ministry of Agriculture, Nairobi.

Socio-economic Profile, Kitui District (1990), Ministry of Planning and National Development and UNICEF, Nairobi.

Thom, D.J., (1980), Land Use and Population Pressure in Central Kitui, Kenya. Association of American Geographers, Louisville, Kentucky.

Wisner, B., (1977), Man-made Famine in Eastern Kenya, The Inter-relationship of Environment and Development. In: Land Use and Development (eds. O'Keefe and Wisner), London.

Zee, J.J. van der (1991), Enhanced Food Security, Health and Nutrition in Kenya's Arid and Semi-arid Lands through the Schools Approach, a Proposal, MRDASAW, Nairobi.