

	<ul style="list-style-type: none"> • Populations of local cattle declined because of their low milk production, low milk prices and small land sizes: <i>Kakamega (central Kabras)</i> • Government AI and veterinary services declined: <i>Rachuonyo (west Karachuonyo)</i>
1990s	Dips handed over to farmer management committees: <i>Kakamega (west Bunyala)</i> Government withdraws from provision of veterinary, AI and extension services. Dips cease to operate: <i>Kakamega (central Kabras)</i>

Table 4 Historical profile of crop farming

PERIOD	Event; activity
1960s	<ul style="list-style-type: none"> • Land adjudication: <i>Nandi (Mutwot), Bungoma, Kakamega (west Bunyala, central Kabras)</i> • Tea planting started: <i>Nandi (Kilibwoni)</i> • Coffee 'forced' on farmers, production increases: <i>Rachuonyo (west Karachuonyo)</i> • Sorghum varieties grown: local brown ('Andino) and red (Ochuti); production high: <i>Rachuonyo (west Karachuonyo)</i> • Credit facilities availed: <i>Nandi (Kilibwoni)</i> • Agricultural extension established, readily available: <i>Nandi (Mutwot)</i> • Maize production increased with introduction of better hybrids: <i>Nandi (Kilibwoni)</i> • Co-operatives increased: <i>Vihiga (Gisambai)</i>
1970s	<ul style="list-style-type: none"> • Land adjudication: <i>Nandi (Kilibwoni), Rachuonyo (west Karachuonyo)</i> • Improved sugarcane (SSC) introduced: <i>Kakamega (west Bunyala)</i> • Tea introduced: <i>Kakamega (central Kabras)</i> • GMR loans availed, boosted maize production: <i>Kakamega (central Kabras), Nandi (Mutwot)</i> • GMR loans stopped in 1978: <i>Nandi (Mutwot)</i> • Sugarcane planting, overproduction and marketing problems: <i>Kakamega (central Kabras)</i>
1980s	<ul style="list-style-type: none"> • West Sugar Company starts buying cane: <i>Kakamega (central Kabras)</i> • Seasonal credit introduced: <i>Nandi (Mutwot)</i> • Army worm infestation and maize smut: <i>Kakamega (west Bunyala)</i> • Sorghum hybrid varieties introduced: <i>Rachuonyo (west Karachuonyo)</i> • Number of co-operatives decreased: <i>Vihiga (Gisambai)</i> • Slump in coffee prices, crop uprooted and replaced by maize and bananas: <i>Rachuonyo (west Karachuonyo)</i>
1990s	<ul style="list-style-type: none"> • Cassava and maize diseases increase: <i>Kakamega (west Bunyala)</i>

2.1 Current production systems

Despite the obvious presence of indigenous livestock, crop husbandry dominates agricultural activities in all areas studied except Nandi district where dairy is relatively more prominent. Table 5 shows the basic comparisons across the districts studied. Land size per household is low ranging from one to four acres in Kisii, Nyamira, Vihiga and Kakamega. Households in Bungoma, Rachuonyo and Nandi have larger acreage (over 10 acres). Leasing of land is common, especially in Kakamega where it is rented at Kshs 1,000 per acre per year. Typical farms practice mixed farming, combining cash and food crops with livestock production. The main cash crops are coffee, tea, sugar cane for sugar production (SSC) and juice sugar cane for chewing (JSC), and pineapples. The main food crops are maize, beans and sweet potatoes. Others food crops include bananas, cassava, finger - millet, sorghum, groundnuts, vegetables and arrowroots. Surplus food crops are also sold for cash.

The main livestock types are cattle (pure breeds or grade, local Zebu and crosses), poultry (exotic and local chicken), sheep, goats and donkeys. The livestock are fed on natural pastures, Napier grass, banana stems, sweet potato vines, vegetable waste, sugar cane leaves and tops, maize stover and shrubs. Cattle are mainly grazed though there is increasing confinement by tethering, zero-grazing or semi-grazing systems. Use of concentrates was not high and was said to be common in the dry season when pastures and fodders are in short supply.

2.2 Crop production

In Kakamega, Bungoma, Vihiga and Rachuonyo, maize, beans, bananas, and sorghum are the main food crops while sugar cane (SSC) and coffee are the main cash crops. Others are cassava, bambara nuts, ground nuts, simsim, though their production has been on the decline over the years. In Kisii and Nyamira and Vihiga maize, beans, bananas, millet and sorghum are the main food crops while coffee and tea are the main cash crops. In all the places beans are intercropped in maize. On a very low scale in the regions there are sweet potatoes, pumpkin, indigenous vegetables and arrowroots. Juice sugar cane (JSC) is grown in Kisii and Nyamira as a food and as a cash crop. Wheat was mentioned in Nyamira, but on small plots. However, it appears to be a very recent addition in the farms and is gaining popularity. Sorghum and finger millet in the region is gradually being replaced by maize which is less laborious to grow, process and is preferred increasing for consumption.

Most farming activities in the region follow the rainfall pattern that is bimodal with the long rains occurring from April to June and the short from August to October. The dry season spreads from November to February. Since the short rains are not heavy and not much happens in this season in many parts. Kakamega has one long rainy season from mid March to August while in Kisii and Nyamira, there is rainfall every month of the year, the least being in January and July, the highest in April and May. In those areas and Vihiga a second crop of maize and beans is grown during the short rains.

Table 5 Characteristics of the production system for a typical household

	Sites and Districts													
	Kakamega		Nandi		Bungoma		Vihiga		Rachuonyo		Kisii		Nyamira	
	Navakholo	C. Kabras	Kilibwoni	Mutwot	Nangili	Tembetela	Mbihi	Gisambi	Kakelo Dudi	Kojwang Katunde	Marani	Suneka	Bokia-mburi	Ekerenyo
Average land size (acres)	3	4	15	30	4-5			0.5-0.9	2	5	2	1	2	1
Livestock														
Zebu cattle	< 10	6	0	1	5	3	2	5	10	2	5	2	2	1
Crosses		3	5	3					1	0	0	2	2	5
Grade cattle		1	5	3					0	2	2	1	1	1
Indigenous poultry	10	50		10	50			10	50	10	20	5	5	10
Exotic poultry		10		3				10	0	0	20	10	10	100
Shoats	<5				5			8	20	3	5	3	3	4
Crops	Cassava Beans Ground nuts Arrow roots Maize Sugar cane	Sugar cane Maize Sweet potatoes Beans Bananas Millet Sorghum Ground nuts Vegetables	Maize Beans Sweet potatoes	Maize Beans Sweet potatoes Vegetables Bananas	Sugar cane Maize Beans Bananas	Maize Beans Fruits Coffee Tea Millet Sorghum Napier	0.5-0.9	Maize Beans Cotton Sorghum Cassava Sweet potato Ground-nuts Napier	Maize Beans Sugar cane Cotton Groundnuts Napier Finger-millet Sorghum Sweet potatoes Cassava	Maize Beans Coffee Tea Bananas Napier Vegetables	Maize Beans Coffee Tea Banana Finger millet Napier Vegetables	Maize Coffee Tea Banana Sugar cane Finger millet Napier Vegetables Groundnuts Sweet potatoes	Maize Coffee Tea Banana Finger millet Napier Vegetables	Maize Coffee Tea Bananas Napier Vegetables Pineapple Sweet potatoes

The early part of the year before the long rains is dominated by land preparation and planting the main maize/beans crop. Weeding follows just as the rains set in April and May. Beans are harvested between May and August, while maize is harvested between September and November. In Kisii, Nyamira and Vihiga the second crop of maize and beans planted during the harvesting of the first crop is harvested early the following year. In Kakamega the short rains are used for planting beans, sweet potatoes vegetables and groundnuts. Most of the biannual food crops (bananas, vegetables, etc.) are established during the long rains. Coffee and tea are perennial but have peak-harvesting periods from September to November and April to October respectively. There is no distinct periodical activity for sugarcane. Once sugar cane (SSC) has been planted weeding takes place six times in a 22 months cropping season. It is then harvested and all the stumps burned down to give way to a new crop. Often the buyer company does the planting and cutting.

2.3 Livestock production

All livestock types are kept in all the areas although in Nandi, dairy production is the predominant agricultural enterprise with tea as the main cash crop. In Kakamega, Kisii, Rachuonyo, and Nyamira most of the farm holds have about three to five Zebu cattle per farm producing one litre of milk per cow per day kept by grazing mainly on unimproved and some improved pastures as well as at the roadsides. The few farmers with grade cattle keep on average about two cows producing an average of seven litres of milk per cow per day (ditto) or three crosses producing an average of five litres per cow per day per under zero or semi zero grazing in most areas. The low number of grade animals kept per household and their low productivity is a result of low feed supply, particularly during the dry season, and poor husbandry methods and their interactions that result in deaths of these types of cattle. The prevalence of the Zebus in Kakamega is associated with the cultural practices (dowry payment and prestige) where the number of cattle per household is more valuable than the quantity and quality of their produce (milk). Some farmers reported problems with grass and fodder legume seed acquisition, e.g., Rhodes, Desmodium, Lucerne, fodder trees for supplementation forcing them to rely on Napier grass and natural pastures. The main planted forages are Napier grass, sweet potatoes and crop residues are used routinely.

There are on average 10 to 50 chickens and three to five heads of goats and sheep per farm, all of them indigenous and kept for egg and meat consumption as well as a form of capital. Donkeys are used for traction and means of transport. Ducks are not popular among the farmers and the market outlet is minimal. Pigs are not popular because they feed a lot, they are destructive and are at sometimes associated with witchcraft.

There is high milk production during the peak rainfall period and demand and prices tend to be low. Towards December the demand increases and prices may improve as supply declines. The sale of cattle is high from January to March when animals are culled as a result of inadequate forage and to raise school fees. Sales are lowest in June increasing up to October before declining since there is then a low supply of the animals.

2.3.1 Livestock feeding calendar

The quantities of Napier and natural pasture grass follow the rainfall patterns while banana pseudo-stems, sweet potato vines and sugar cane tops are available uniformly throughout the year though the latter are rarely used. Utilisation of Napier grass and by-products stover and bean hauls is highest in the dry season between December and February, and concentrate use increases when Napier grass is not readily available. Concentrates used in livestock feeding include bran, dairy meal, local brewers waste, molasses and spoilt maize. In most parts dry maize stover and bean haulms are available for use after harvesting the grain. In some areas, Napier grass is left to overgrow and the canes are used to make baskets.

2.3.2 Livestock breeding

The main breeding system is by natural service either using improved bulls introduced by previous development projects or the local zebu. At the moment AI services are provided by the government at the district veterinary offices and some very few private providers. In the Kakamega and Rachuonyo attempts to set up private AI services have not fared well because the farmers' demand cannot sustain them. The farmers, moreover, find all the services expensive at the range of KSh 300.00 to 2000.00 depending on the quality and source of the semen and transport charges. Natural service dominates using locally owned bulls and bull schemes set up by Livestock development Project (LDP), Heifer Project International (HPI) and a few other NGO projects. Their impact at improving the dairy genotype is, however, so far very low. In Rachuonyo there are only 3,000 grade cows to the 150,000 zebus despite more than ten years of LDP and National Dairy Development Programme (NDDP) activity.

2.3.3 Livestock diseases

Tick borne diseases (TBDs), especially East Coast Fever (ECF), are endemic throughout the area. There are very few communal and privately owned dips and these are only occasionally functional. Most farmers control ticks by spraying occasionally their animals at home or dip where dips are functional. The incidence of TBDs and worm infestation are high during the rainy season from April to November, while Foot and mouth, lumpy skin and Newcastle

disease mostly appear in the dry season. In Kisii and Rachuonyo the prevalence of notifiable diseases especially foot and mouth disease (FMD) and lumpy Skin was associated with uncontrolled movement of livestock into and out of the districts while in Kakamega the presence of Trypanosomosis was blamed on tsetse infestation and proximity to forests.

2.4 Labour profile

Women are busy throughout the year as they perform more duties on the farm from cultivation and harvesting to household chores. Men are more busy in the planting season when demand for labour is high. January to May is the peak labour period due to the many farming activities (land preparation, planting and weeding the year's main crop) while July to October have the least labour demands. Tea picking is less in the months of January to March then increases steady to peak in October.

The cost of hired labour in the whole of western Kenya was uniform at KSh 50 (and a meal) per working day (7 am to mid-day) regardless of gender. Permanently employed labour, however varied from KSh 700 to 1500 per month including food and accommodation but depending on the farmer's resource capability and /or length of employment. There is no child labour, i.e. no use of school-age children, except when the farmers kids were on holiday from school. Malaria cases in humans increase just after the rains between July and August.

2.5 Farm and community resource maps

Farm resource maps indicated some degree of intensification in all areas with livestock playing an important role as a source of food, income and manure (Annex 2). Most areas were predominantly producing own food and show much diversification in production. There was widespread use of crop by-products (bananas and sugar cane tops) to feed livestock. All areas indicate high market activities with sale of food and cash crops, milk and also for sourcing inputs such as fertilizer and at times food. Many areas indicated communal use of labour on a rotational basis to help out with farm activities. In Kisii, there is sale of trees for firewood and charcoal as well as sale and purchase of manure. Issues arising include increasing intensification, concern with market access and policies on inputs and output prices and marketing.

Community maps (Annex 2) show close relationships between communities and the ministry of agriculture, churches, schools, self help groups, markets, provincial administration, health centres, tea and coffee factories and the veterinary department. The communities did not have close relationships with many service providers including; KARI, water development agencies, electricity providers, stockists, Agricultural Finance Corporation (AFC) for credit.

Issues arising include weak core support services and identification of probable dissemination avenues namely provincial administration, ministry of agriculture, schools and churches. There is a need to strengthen weak linkages between farmers and KARI, AFC and stockists.

2.6 Constraints to crop and livestock production

The constraints to farming in general and livestock in particular were discussed with the farmers in the various sites. There were 25 constraints mentioned between the 14 farmers' groups in declining order of how many times they were mentioned (Table 6). Out of the 25 constraints, three (animal diseases, extension services and animal breeding) were mentioned by more than 11 groups, eight (roads, crop diseases, cost of inputs, water, land size, capital, marketing and quality of inputs) by between seven to ten groups, seven (output prices, soil fertility, human diseases, veterinary services, credit, management of dips and livestock feeds) by between four and six groups and seven (crop pests, gender imbalance, theft of animals, other sources of income, corruption, poverty and management of cooperatives) by fewer than three groups. The constraints are discussed in order of declining importance as defined by the number of times they were mentioned by the groups.

Animal diseases came up as farmers argued that the presence of diseases has clearly contributed to the low presence of dairy animals in most of Western Kenya. They said that local indigenous animals are easier to keep and their dominant numbers could be attributed to their ability to withstand the prevalent diseases. Diseases are linked to poor disease prevention measures such as **low number of dips, poor management of the few dips available**, poor home spraying methods. Some service providers felt that farmers may be finding the cost of acaricides to be too high and using low strength washes or spraying their animals irregularly. This was also linked to doubtful **quality of inputs**. Linked to this were **lack of veterinary services and the high costs** of the ones available. Many farmers have yet to get over the former heavily subsidised government services.

Lack of farmer training and extension services was a common constraint and mainly referred to inadequacy in training farmer on how to keep and maintain dairy animals. It was described in various ways in different places but mostly pointed out to inadequate extension staff. During a discussion with the field staff themselves, they pointed out the very low worker to farmer ratio, though no figures were given. Then there is the issue of inaccessibility linked to either the terrain that cannot be covered fast enough by whatever transport means available (on foot or by bicycle) or the lack of such transport. The increase in number of dairy animals in the early 70s after introduction through AI services or the dairy projects that existed then was not maintained. Many of the animals died because the farmers could not keep up with the nutritional and health management demands the animals required. This can

be directly linked to the lack of education. There was very little evidence of farmers using available technology to sufficiently utilise the available feed resources. For example, even if some farmers kept poultry there was no one utilising the birds' dropping as a feed supplement.

Inadequate breeding services was reported variously as **lack of good dairy animals, lack of breeding bulls, ineffective AI services, and expensive AI services from those who provided them.** Just like clinical veterinary services the privatisation of AI provision has resulted in total lack of private providers in some places (Kakamega), and a very high cost for the ones existing. Though this is the constraint projects such as HPI and LDP have chosen to facilitate their impact in increasing the number of cattle of having dairy genotypes has not been very obvious. Farmers expressed an interest in the establishment of more bull schemes and many farmer groups have been set up primarily for this purpose but they were not successful. Again there was a possibility of farmers pointing out this constraint hoping to be supported by the project but the very low numbers of grade cattle in these areas makes this an important starting point to the development of the region's dairy industry.

Infrastructure (roads) as reflected in the rundown condition of main and access roads that have affected all sector including agriculture. Services and markets have become inaccessible in some places and the cost of transport has risen as providers charge the higher vehicle costs to users. Thus, the cost of veterinary clinical and AI services have become correspondingly higher. In Kisii, Nyamira and Rachuonyo where farmers sell their own milk (i.e. with no middlemen or small traders) this has meant higher costs for each litre that finally reaches the consumer. There is also the element of time spent as farmers walk or cycle long and difficult distances to deliver milk leaving little time for attention to management of their cows.

Crop diseases show the prominence of crop production in the region and the dependence the farmers have on these crops for food and income this constraint was inevitable and was mentioned in almost every site visited. Both cash crops (tea, sugarcane) and food crops (maize, pineapples, and sorghum) were reported to be under some recent attack by diseases or pests that the farmers have not yet overcome.

Lack of water was mostly referred to inaccessibility to clean water or to mains supply which meant reliance on rain catchment and rivers. It was a common constraint, but did not feature high in ranking.

Table 6 Ranking of constraints to crop and livestock production in declining order of importance

	Kakamega			Nandi			Bungoma			Vihiga			Rachuonyo			Kisi			Nyamira	
	Navakholo	Kabras	Kilibwoni	Mutwot	Nang'ili	Tembelela	Mbihi	Gisambai	Kakelo Dudi	Kojwang Katunde	Marani	Suneka	Bokiamburi	Ekerenyo						
Animal diseases	5	3	3		12		9	6	5	6	4	7	8	6						
Extension services	8	2	7	4	2	2	6	4	8	2	2	6								
Animal breeding		8	10	5	3	1	11	5	4		5	4	10							
Roads	1	7	1				4	7	7	4	9	7	6	4						
Crop diseases	4		3		11		9	6		7		4	5	7						
Cost of inputs	6	4	5	6	4		2			7	7	2	4							
Water	9			1	9		11		3	3	12	11	11	2						
Land size	10				9		7		9	10	10	12	12	2						
Capital		5						2	1	1	1			1						
Marketing		9	11	3				6	8		9			8						
Quality of inputs			2	7	12		3			6	6		6							
Output prices	2		8		1	5				11			8							
Soil fertility		6	9		14	9	1	9						5						
Human diseases					6	3		1	5				2							
Veterinary services	7				5	8				2			3							
Credit		14	6	2				2												
Management of dips		10			13	6								10						
Livestock feeds					8	5		8		7										
Crop pests	3				7		8													
Gender imbalance						4														
Theft of animal							5							11						
Other income sources						6														
Corruption		1						1												
Poverty																				
Management of coops													1							

Declining land sizes was a constraint in the entire region given the high population increases and continuous sub-division of land among children to units that could barely support sustainable agricultural enterprises. This meant that farmers have to adopt intensification technologies that are again hindered by their lack of capital and education/knowledge on what can be done.

Lack of capital was also a common constraint, and in areas where farmers identified it as such it featured as the top most hindrance. It was also reported as 'high cost of inputs' and in one place (Nandi) as 'the high cost of transporting produce to market' relative to the price of milk. There was a possibility of the farmers pointing out this constraint in the hope that the project was set to provide material support and in some areas this could have been the reason why it was stated. Previous projects in the area have had a strong feature of material provision but this approach has not had any sustainable impact because the achievements made by these projects were not obvious. In Kakamega and Bungoma lack of capital could be addressed by the incomes the farmers got from sugarcane. However, but this has not been the case because they said the cane took too long to be harvested due to crop type or there were delays in harvesting the cane (a management problem). The prices of the cane delivered were also reported to be low.

This was pointed out in few places but is related to the above constraint. There were very few institutions offering some credit arrangement to smallholder dairy farmers. In Nyamira it was the stringent loan terms that were mentioned while in another it was the very high interest rates. All in all very few farmers were ready to go for credit because they were afraid of not being able to repay, especially from dairy production and milk sales. The only **credit facilities** mentioned were those associated with the cash crops where farmers obtained material inputs (seeds, fertilisers, implements, etc.) payments were deducted from the produce delivered. As a result these facilities were only available for use in the cash crops but not to dairy. This was closely related to low **output prices** which were mentioned too.

Poor marketing systems were mentioned for all farm products but more so for milk. This was exacerbated by lack of co-operatives and poor management and organization where they exist. This leaves farmers to market their small outputs on their own and covering long distances.

Soil fertility could have contributed to the feeding constraint. It was mentioned everywhere as having compounded the problem of small land sizes. The farmers felt that their soils were not as good as they used to be previously when they could plant crops with very little or no fertilisers. As a result the production of, not just the foods but forage for the animals, had

declined over the years. In Kakamega, Rachuonyo and Nandi poor soil quality was also associated with **soil erosion** in the long rains.

Human diseases were mentioned especially malaria in Kisii and Nyamira, and AIDS/HIV in Rachuonyo. This was as a result of declining health care services in public hospitals.

Lack of feeds was mentioned in only five of the seventeen sites this constraint has contributed to other problems mentioned by the farmers. This refers to the **low milk yield** and, as a consequence, **low incomes from dairy** farming. The main feed resources for cattle are the rain-dependent grass pastures and fodders. Though the area is well endowed with rainfall, especially Vihiga, Nandi, Kisii and Nyamira the land sizes are too small to provide adequate amounts for the stocks kept and especially for grade cows. The farmers also complained of **not being able to conserve feeds** when there was plenty particularly during the rainy season due to lack of know how. The extensive use of land for food crops and cash crops implies that the utilisation of residues and by-products can be used to boost feed supply and this was not evident. For example sugarcane tops were not being used and in some places the farmers said tops actually reduced milk yield.

Gender imbalance was mentioned where women talked of being left to do all the work. One of the reasons why breed development projects, e.g., LDP and HPI have not done well in Kakamega was felt (by the extension workers) as being the use of women groups without consulting or involving the men.

Corruption was mentioned in Kakamega and associated with general poor governance and administration. This can be associated with **mismanagement of co-operatives** mentioned in Kisii and quite highly ranked there.