SMALLHOLDER DAIRY PRODUCTION AND MARKETING IN WESTERN KENYA:

A Review of Literature

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Acronyms and Abbreviations

ABS	American Breeding Services.
AI	Artificial Insemination.
C.A.I.S	Central Artificial Insemination Station.
HPI	Heifer Project International.
ILRI	International Livestock Research Institute.
KARI	Kenya Agricultural Research Institute.
KCC	Kenya Co-operative Creameries.
KDB	Kenya Dairy Board.
K.N.A.I.S	Kenya National Artificial Insemination Services.
Lagrotech	Lowland Agricultural Technical Services.
LBDA	Lake Basin Development Authority.
LDP	Livestock Development Project.
LM	Lower Midlands agro-ecological zones (1000-1500m above sea level).
MoARD	Ministry of Agriculture and Rural Development.
NARP II	National Agricultural Research Project II.
NDCRP	National Dairy Cattle Research Programme
NGO	Non Governmental Organization.
UH	Upper Highland agro-ecological zone.
UM	Upper Midlands agro-ecological zones (1500-2000m above sea level).

EXECUTIVE SUMMARY

This literature review report highlights the current status of smallholder dairy production and milk marketing in Western Kenya. It forms the basis and entry point for Smallholder Dairy (R&D) Project activities in Western Kenya in its second phase. A brief history of the dairy industry in Kenya is also presented. The report also highlights cattle production systems, types, population and distribution in RRC-Kakamega mandate region, but focuses more on Nandi, Vihiga, Kakamega and Bungoma Districts of the region identified by the project for implementation of its activities. Current trends in milk production and marketing including pasture and fodder production in those Districts is also discussed. The report also indicates the livestock extension services, research and development programmes within the region.

1.0 GENERAL INTRODUCTION

1.1 Dairying in Kenya; historical perspective and current status

Kenya has a long tradition in dairy production which was mainly non-commercial milk production from the indigenous cattle (zebu). The commercial dairy industry in Kenya dates back to 1920 when white settlers imported purebred dairy cattle from Europe. The commercial dairy farming developed in two distinct phases. Firstly, large-scale dairying that was on farms operated by Europeans on the Kenyan Highlands and secondly, from the 1950's on African smallholdings. The basis for dairy development in the African smallholder areas was the Swynnerton Plan of 1954 which introduced a number of policy reforms, which included land consolidation and adjudication, cash crop growing, provision of credit and other infrastructural services for dairy development. Since independence, dairying has been transformed into a predominantly smallholder activity in terms of both volume of production and sales. Presently, milk production is integrated with the growing of food crops like maize and beans in a diversified system where the resources of each farming activity are used to benefit the whole system.

The National dairy herd is estimated at 3 million grade cattle and about 10 million Zebu cattle. Dairying in the country is concentrated in the Rift Valley Province with 48% of all the exotic dairy cattle followed by Central Province (31%), Nyanza Province (15%), Eastern Province (5%) and Western Province (4%). The total National milk production is estimated at 1.826 billion litres per year of which 60% is from the dairy herd. It is also reported that there are over 400,000 smallholder dairy farmers having an average of 2 cows each with a farm size less than 2 ha and contributing to over 80% of the total milk marketed in Kenya (MoALDM, 1993).

Of the 1.826 billion litres of milk produced annually, 893 million litres (49% of the total milk produced or 72% of total milk form dairy breeds) is marketed, the remainder being used for home consumption by farm households. This provides per capita annual consumption levels of 125 million litres (urban) and 19 million litres (rural). Despite the large disparity in per capita consumption between urban and rural populations, the absolute numbers of inhabitants results in an almost equal split in total consumption between sectors (49.9% urban versus 50.1% rural).

The government recognizes the role of the dairy industry in the country's economy. It is a source of income and contributes to the improvement of human nutrition through consumption of milk. Dairying contributes to the beef industry through slaughter of culled cows and steers and is a source of employment. The government's policy paper on dairy sector development (Sessional paper No. 4 of 1981 and revised in 1993) has the objectives of maintaining self sufficiency in milk production, increase productivity through measures that facilitate access to appropriate technologies and inputs, and to improve processing and marketing through policies that encourage competition, efficiency and self sustaining systems. There has been a lot of changes since 1992 when the Government set in motion steps towards complete liberalization of the dairy industry. This started with the liberalization of the pricing policy of milk and milk products. Then followed the privatization and reduced Government involvement in Animal breeding (recording, semen distribution, herd books, etc.) and Artificial insemination services; input and veterinary drugs supplies; Animal health care and dipping services; de-regulation of the processing and marketing of milk; and the

rationalization of the Kenya Dairy Board (KDB) which is the body charged with governing the dairy industry.

It is within this liberalized context that efforts are being made to revitalize the sector through increased support to smallholder dairy farmers. This document reviews the smallholder dairy production and milk marketing in Western Kenya (RRC-Kakamega mandate) and provides some general recommendations based on the past and present experiences. During the inception phase of the National Dairy Cattle Research Programme, co-funded by the Netherlands and Kenyan Governments under the National Agricultural Research Project II (July -December 1994), constraints to dairy cattle production and milk marketing in the RRC-Kakamega mandate districts by a team of research and extension officers were identified and prioritized. The constraints experienced by smallholder dairy farmers in the areas comprised;

1 Feed related factors (high prices of good quality feeds and lack of feeds for the dry season, lack of reliable water supply);
2 Animal health factors (diseases e.g. tick borne, worm infestation, F.M.D and high calf mortalities);
3 Socio-economic factors (lack of credit facilities, low milk prices, lack of milk storage facilities especially evening milk, poor infrastructure and small farm sizes);
4 Genetic and animal breeding factors (prolonged service/calving intervals, high cost of quality breeding stock and lack of organized animal breeding programmes and services).

This project however ended in 1999 before most of these constraints had been properly addressed. It is thus envisaged that the Smallholder Dairy Project will try to address these constraints and hence lead to an efficient and sustainable dairy cattle production and milk marketing system within the region to meet the increasing demand for milk and milk products not only for the region but the country as a whole.

1.2 Description of RRC-Kakamega mandate region

Districts under the mandate region

The Regional Research Centre - Kakamega has a research mandate in eleven districts which include Kakamega, Bungoma, Busia , Bondo, Butere/Mumias, Lugari, Mt. Elgon, Nandi, Siaya, Teso and Vihiga. The total area under the mandate is 9,810 square kilometres.

The agro - ecological zones over the region range from Upper Highland zone one (UH_1) to Lower Midland zone four (LM_4). The largest part of the area is in the lower midlands zones (Table 1).

Table 1. RRC-Kakamega mandate Agro-ecological Zones (area in sq Km)

District	UH_1	LH_{1-2}	UM_1	UM_{2-3}	UM_4	LM_{1-2}	LM_{3-4}	TOTAL sq km
Bungoma	-	-	87	475	224	621	282	1689
Teso	-	-	-	-	-	346	105	451
Nandi	37	994	314	150	267	164	-	1926
Mt. Elgon	-	187	93	17	-	1	-	298
Vihiga	-	-	368	-	-	40	-	408
Bondo	-	-	-	-	-	10	766	776
Siaya	-	-	-	-	-	945	288	1233
Busia	-	-	-	-	-	581	317	898
Butere/Mumias	-	-	-	-	-	741	-	741
Lugari	-	-	-	-	474	-	-	474
Kakamega	-	5	177	37	109	569	19	916
TOTAL	37	1186	1039	679	1074	4018	1777	9810

The farm sizes vary across the agro-ecological zones. In the lower midland zones the farm sizes are small averaging 2 ha per household. The smallest farm sizes, however, are found in the upper midland zone (UM_1) of Vihiga and Kakamega Districts while the average farm sizes per household are large in Nandi and Mt. Elgon Districts, and also in the settlement areas of Lugari and Tongaren (UM_{3-4}).

Table 2. Rainfall and Key Enterprise Systems (KES) in the mandate region

District	Rainfall (mm/year)	Key Enterprise System (KES)
Nandi	1200-2000	Maize, Beans, Dairy
Kakamega	1800-2400	Maize, Beans, Dairy
Butere/Mumias	1700	Dairy, Sugar cane
Lugari	1400	Maize, Dairy, Beans
Vihiga	1600-2000	Maize, Dairy, Cassava, Beans
Busia	1200-1700	Ground nuts, Finger millet, Cassava, Sweet potato
Teso	1200-1600	Tobacco, Cotton
Bungoma	1600	Sugar cane, Maize, Beans, Dairy
Mt. Elgon	1600-2400	Highland climate favours temperate crops, Dairy
Bondo	900-1200	Cotton
Siaya	1200-1800	Cotton, Finger millet, Cassava

Various production systems exist over the mandate region (Table 2). In the LM_1 - LM_3 zones, mainly in Nandi District, dairying is the major enterprise and is also the main source of income. Dairy is kept in the extensive system, where most animals are grazed both on natural or planted pastures and legumes. Most pastures are paddocked and there is an element of fodder production. In Mumias and Butere Divisions of Butere/Mumias District and Lurambi, Kabras and Navakholo Dvisions of Kakamega district and Nalondo Division of Bungoma district, LM_{1-2} is the main sugarcane zone. Sugar cane is the main enterprise and cash earner in those areas. Tea is the major cash crop in UH_1 and LH_2 zones. The main crop enterprises in zones LH_{1-2} and UM_{1-4} are maize, beans, sweet potatoes and horticultural crops. In the UM_1 - UM_3 of Kakamega, Vihiga and Bungoma Districts, maize (usually inter-cropped with beans) and dairy are the two major enterprises. The cattle are grazed or tethered in paddocks of either natural or planted pastures and forage legumes. Other crop enterprises include

sunflower, tea, coffee, sweet potatoes, bananas and horticultural crops. Dairy under zero - grazing is over the years becoming popular in these Districts.

The lower midland zones 3 and 4 are the areas that do not have any cash crop. Rainfall is low and the crop and livestock productivity are also low. The enterprises are maize, beans, cassava, sorghum, finger millet, groundnuts, sweet potatoes, green grams, Soya beans, a wide variety of exotic and local and indigenous vegetables and fruits. The cattle kept are local zebus that are poorly fed and managed.

Table 3: Agro-Ecology of the mandate region; soil types, total land area and agricultural area in ha.

District	Total land area (ha)	Elev (m asl)	Slope %	% of total	AEZ	% of Total	Soil	% of Total	Total Agric. (ha)	Agricultural area (Ha)		
										Rainfed	**Irrigated**	**Irrigated potential**
Nandi	274,500	1500-3000	0-8 8-25 25-35	32 15 15	LH 1-3 LM 1-4 UH 1 UM 1-4	52 8 2 38	Nitrosols Lixisols Cambisols Ferralsols	37 19 14 12	192,600	192,600		
Kakamega	107,000	1000-2000	0-8 8-25	94 6	LM 1-2 Um 1-3	62 38	Acrisols Cambisols	45 40	55,800	78,838	1,810	11,852
Butere/ Mumias	91,200	1000-1500	0-8 8-25	99 1	LM 1	100	**Acrisols** Luvisols Gleysols	48 18 13	74,100	74,100		
Lugari/ Malara	98,600	1500-2500	0-8 8-25	81 19	LM 2-3 UM 1	26 74	Ferralsols Acrisols Lixisols	32 28 9	84,100	84,100		
Vihiga	52,200	1500-2500	0-8 8-25	56 44	LM 1-2 UM 1	10 90	Cambisols Acrisols Cambisols	45 40 9	40,800	40,800		
Busia	111,900	1000-1500	0-8 8-25	92 8	LM 1-4	100	**Ferralsuls** Gleysols Acrisols Cambisols	26 24 20 18	89,800	84,031	600	5,169
Teso	50,700	100-1500	0-8 8-25	97 3	LM 1-3	100	Acrisols Gleysols	49 42	47,515	45,100	150	2,424
Bungoma	211,000	1500-2500	0-8 8-25 25-35	98 2 <1	LM2-3 UM2	59 41	Acrisols Gleysols Luvisols Ferralsols Cambisols	38 20 17 13 10	134,500	169,400	4,787	10,292
Mt. Elgon	96,400	1500-4000	0-8 8-25 25-35	14 75 11	LH1-2 LM2 TA1-2 UH0-1 UM1-2	23 2 18 36 21	Nitrisols Cambisols Leptosols	67 17 10	96,600	95,421	53	126
Bondo	107,655	1000-1500	0-8 8-25	97 3	LM2-5	100	Acrisols Cambisols Fluvisols Vertisols	46 14 13 12	107,655			
Siaya	151,183	1000-1500	0-8 8-25	97 3	LM1-4 UM1	99 1	Gleysols Cambisols Acrisols	31 28 29	151,183	132,467	3,176	14,540

There is heavy reliance on family labour to carry out farm activities on smallholder farms in the region. It is evident in recent years that a large share of livestock activities is carried out by women, and this is mainly attributed to three factors. Firstly, animal care traditionally was an important male activity, however in recent years, men have increasingly directed their labour towards off-farm wage earning opportunities, leaving women responsible for much of the farm work. Secondly, with the advent of compulsory education, children are now available to help with the care of livestock only in the afternoon, or weekends, and during holidays. Thirdly, the intensification process itself which focuses labour on food crop production and the provision of cut and carry system of feeds to animals in zero or semi - zero grazing systems has brought livestock care more closely into the sphere of women responsibility. The concern should thus be to develop a strong extension programme that would offer training geared to improving smallholder women skills in the feeding and management of dairy cattle.

Land use dynamics

The land tenure system is free hold, with owners having title deeds. There are though few and isolated cases of communal and urban/peri-urban land tenure systems. However, land is continuously being sub divided into uneconomical units by families as grown up sons seek ownership rights. The region has high potential for both crop and livestock production, though, the productivity is low largely due to low use of inputs and extensive cropping leading to over exhausting the soils.

Most farmers in RRC-Kakamega mandate region practice mixed farming with both crops and livestock farming being practiced. Maize is the staple food crop in the region and is grown for both subsistence and commercial purposes. Other food crops include finger millet, sorghum, cassava, rice and sweet potatoes. Horticultural crops like bananas, kales, French beans, onions and tomatoes are also grown. The cash crops in order of importance include sugar cane, tea, coffee, tobacco, sunflower and cotton. Groundnuts and simsim are also grown but on small scale. Livestock especially cattle, poultry, sheep and goats are kept in the region. Others include pigs, donkeys and rabbits. The acreage under pastures in the region is low as most of it is under cash and food crop production, and this has greatly hindered the growth of the livestock industry.

The RRC- Kakamega mandate region has a multi ethnic human population (Table 4). The main inhabitants of Nandi District are the Nandis (A Kalenjin extraction) and a few Luhyas mostly of Maragoli origin, who migrated to the area. Vihiga District is largely inhabited by Luhyas (A Bantu extraction), mostly Maragoli, Banyore and Tiriki sub tribes while Lugari District and parts of Bungoma District (Tongarren Division) is multi ethnic comprising Luhyas, Kalenjins and Kikuyus who migrated and settled in the area after independence.

Table 4: RRC- Kakamega mandate Districts human population figures in '000. (1999 National census report).

Districts	Males	Females	Total
Bondo	112	135	247
Bungoma	426	452	878
Butere/Mumias	227	251	478
Busia	174	197	371
Kakamega	290	315	605
Lugari	106	111	217
Mt. Elgon	62	68	130
Nandi	291	291	582
Teso	82	89	171
Vihiga	233	266	499
Siaya	220	260	480
Total	**2223**	**2435**	**4658**

Mt. Elgon District is largely inhabited by Saboats (A Kalenjin Extraction) and few Bukusus, a Luhya sub tribe while Bukusu and Tachoni Luhya sub tribes inhabits Bungoma District. Luos inhabit Siaya, Bondo and parts of Busia Districts. Isukha, Idhako, Batsotso, Banyala, Kabras, Wanga, Kisa, Marama, Marachi and Wakhayo Luhya sub tribes inhabit parts of Kakamega, Butere/Mumias and Busia districts and Atessos occupy Teso district. (JAETZOLD and SCHMIDT 1982). These ethnic diversities have a bearing on the development and adoption of the dairy cattle production technologies in the region.

2.0 LIVESTOCK PRODUCTION IN THE REGION

2.1 Cattle Production systems, Population and Distribution

RRC-Kakamega mandate area has about 2 million cattle of which 80% are local zebus and 20% improved. Siaya District has the highest number in total cattle followed by Nandi, Kakamega, Bungoma, Busia and lastly Vihiga. This distribution is related to land pressure as a result of human population increases, feed supply and husbandry methods. The high numbers of zebu cattle in the region is also associated with the socio-cultural practices (dowry payment and prestige), including their ability to resist diseases especially tick borne, where the number of cattle per household is more valuable than the quantity and quality of the product (milk).

The cattle production systems in RRC-Kakamega mandate area can be classified broadly as Small scale dairy production system; Small scale dairy/meat production system; Small scale dairy/meat/traction production system; and Large scale dairy production system. Within these production systems, there are three different breeds of cattle namely; Pure breeds (graded cattle), cross breeds and local zebu cattle. These cattle are reared under free grazing/tethering, semi-zero grazing or zero grazing systems and depend on natural pastures/forage, fodder crops and agricultural by-products as their main feed source.

These production systems are distributed across the different agro-ecological zones. Large-scale dairy production is practiced in agro-ecological zone LH_{1-3}, whereas small-scale dairy production is confined to agro-ecological zones LH_{2-3} and UM_{1-4}. Small scale or large scale dairy farmers are not found in agro-ecological zone LM_{1-4} which covers 61% of the total mandate area, whereas small scale dairy/meat and dairy/meat/traction production systems are found across all the agro-ecological zones.

Local zebus are found in all agro-ecological zones within the region except in agro-ecological zone $LH_{1-3.}$ Graded cattle and crosses are largely confined to agro-ecological zone LH_{1-3} that covers 12% of the total mandate area and agro-ecological zone UM_{1-4} that covers 11% of the total mandate area. Agro-ecological zone LM_{1-4} that covers 61% of the total mandate area does not have improved cattle (pure breeds and crosses). This therefore means that 77% of the total mandate area comprises small- scale farmers who keep local zebu cattle and low value crosses across agro-ecological zones UM_{1-4} and LM_{1-4}.

Graded (improved) cattle are mainly found in Nandi District followed by Kakamega, Bungoma, Vihiga, Siaya and lastly Busia. It is also observed that the density of improved cattle in these Districts is 7 animals per km^2 except in Nandi where the density is 115 animals per km^2. This greatly contrasts with densities reported in other Districts across the country such as: Trans Nzoia, 44 animals per km^2 (76% of the total District herd); Uasin Gishu, 86 animals per km^2 (93% of the total District herd); Kiambu, 61 animals per km^2 (87% of the total District herd); Kirinyaga, 45 animals per km^2 (73% of the total District herd); Murang'a, 73 animals per km^2 (95% of the total District herd); and Nyandarua 81 animals per km^2 (96% of the total District herd). It may be necessary at this stage to give some detailed assessment of the situation in some of the Districts under RRC-Kakamega mandate area with high populations of cattle.

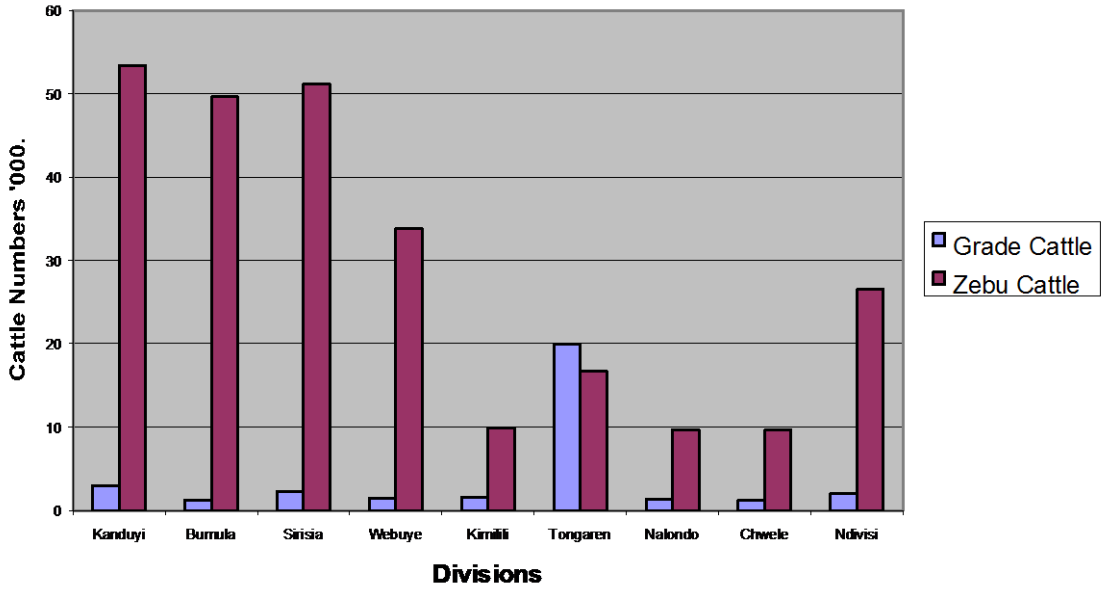
Bungoma District

Bungoma borders Mt. Elgon District to the Northwest, Trans Nzoia district to the North, Kakamega District to the East and Southeast, Busia and Teso Districts to the West and Southwest and the Republic of Uganda to the Northwest at Lwakhakha border point. The District lies between latitude 0^0 25.3' North and 0^0 53.2' North and longitude 34^0 21.4' East and 35^0 04' East and covers a total land area of 1689 square kilometres, about 25% of the total area of the province, out of which 1438 square kilometres is arable land and 1,175 square kilometres is under cultivation. Administratively the district is divided into nine Divisions (Nalondo or Central Division, Kanduyi, Chwele, Bumula, Sirisia, Kimilili, Ndivisi, Webuye and Tongaren), 42 Locations and 105 Sub Locations.

Tongaren Division of the District has the highest population of grade cattle with more or less the same population of zebu cattle, though the other Divisions have low and almost comparable populations of grade cattle. This is because of the settlement scheme that had an early start on dairy activities in the Division pre and post independence. Kanduyi, Bumula and Sirisia Divisions have the highest population of zebu cattle as compared to the other divisions (fig. 1) as a result of the socio-cultural roles (dowry payments, prestige, sales for income) these cattle play in the livelihoods of the local communities and the animals' resistance to diseases. The cattle population in the District has been fairly constant over the years with population of zebu cattle being very high as compared to that of grade cattle and crosses being very high (fig. 2). The populations of both grade and zebu are extremely low in

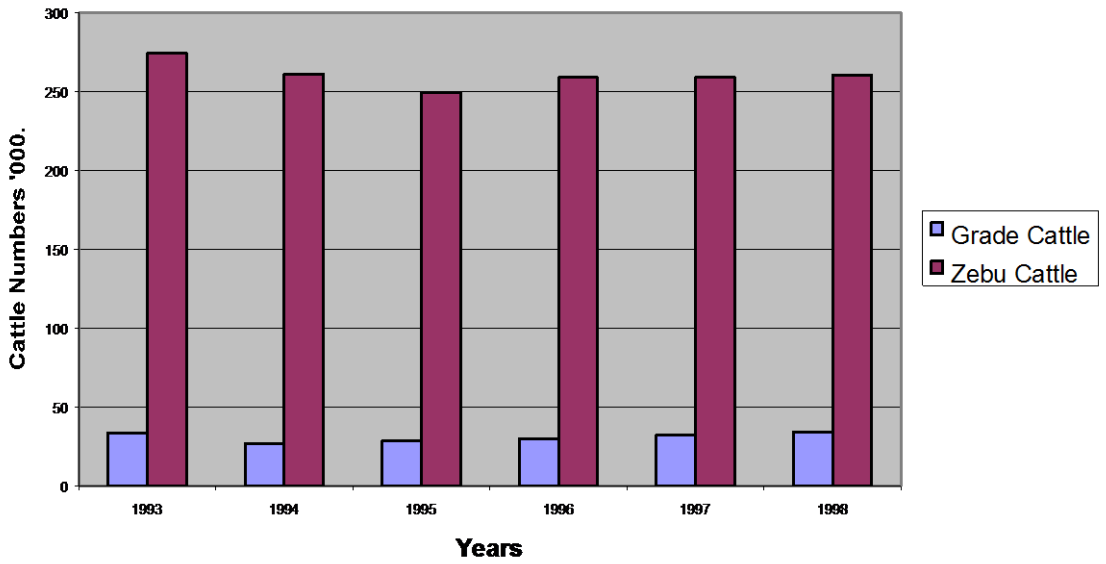
Nalondo, Kimilili and Chwele and this is mainly attributed to sugarcane and tobacco, major cash crops and farm income earners in those Divisions

Figure1. Cattle population ('000) and distribution by Division in Bungoma District (1998).



Source: MoARD Bungoma District Annual report (1998).

Figure 2. Cattle population ('000) trends in Bungoma district (1993 - 1998).



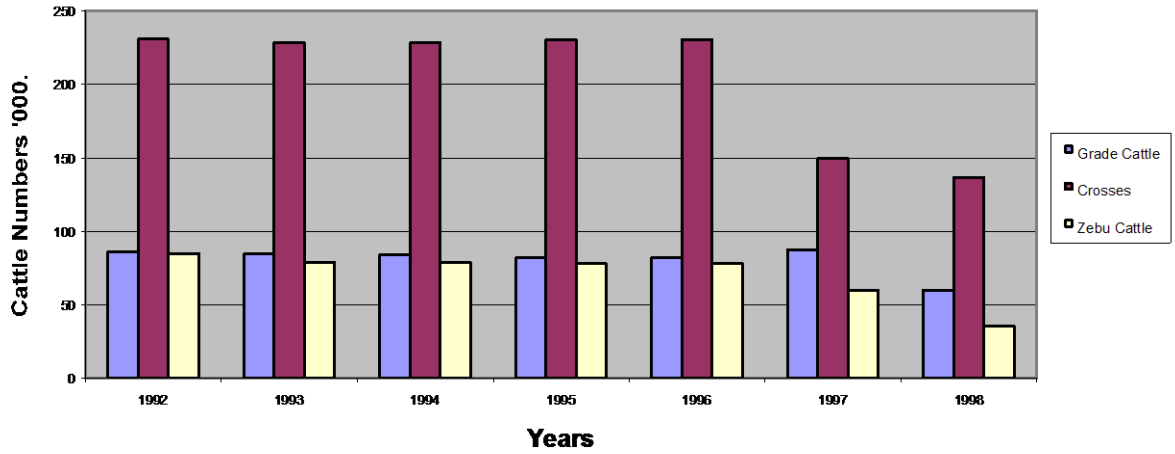
Source: MoARD Bungoma District Annual reports (1993-1998)

Nandi District

Nandi district is one of the districts in the Rift valley province and falls within RRC-Kakamega regional mandate. Uasin gishu District to the North and East, Vihiga, Kakamega and Lugari Districts to the West and Kericho and Kisumu Districts to the South border the district. It falls in the high potential region with a surface area of 1926 square kilometres of which 1401 sq. Km. is arable land. Forests, rocks, water and swamps cover the rest of the land. It has an average land size of about 7 acres per household (District Development Plan, 1997-2001). Administratively the District is divided into nine divisions (Kapsabet, Kilibwoni, Nandi hiils, Aldai, Kaptumo, Kosirai, Kabiyet, Kipkarren and Tindiret), 91 Locations and 283 Sub Locations.

The District is predominantly dairying with farmers keeping pure breed dairy cattle and high grade crosses with tea as the main cash crop. Zebu cattle are, however, still kept in the lower parts of the District neighboring Kisumu District, where sugar cane as a cash crop is grown. Cattle management in the District is mostly by grazing and semi-zero grazing with zero grazing on few farms. Development in the dairy industry in Nandi District unlike in the other Districts within the region could be attributed to the presence of Kenya co-operative creameries and other well organized milk processing and marketing societies. The proportion of high milk producing grade cattle is also high with the numbers of zebu cattle steadily reducing over the years (fig.3). There was, however, a drop in the grade cattle population in 1998 and in the exotic crosses between 1997 and 1998 and this was as a result of the prolonged dry season experienced between those years. Kilibwoni and Kabiyet Divisions of the District have the highest numbers of grade cattle and crosses with a few zebu cattle.

Figure 3. Cattle population ('000) trends by type in Nandi district (1992 - 1998).



Source: MoARD Nandi District Annual reports (1992-1998).

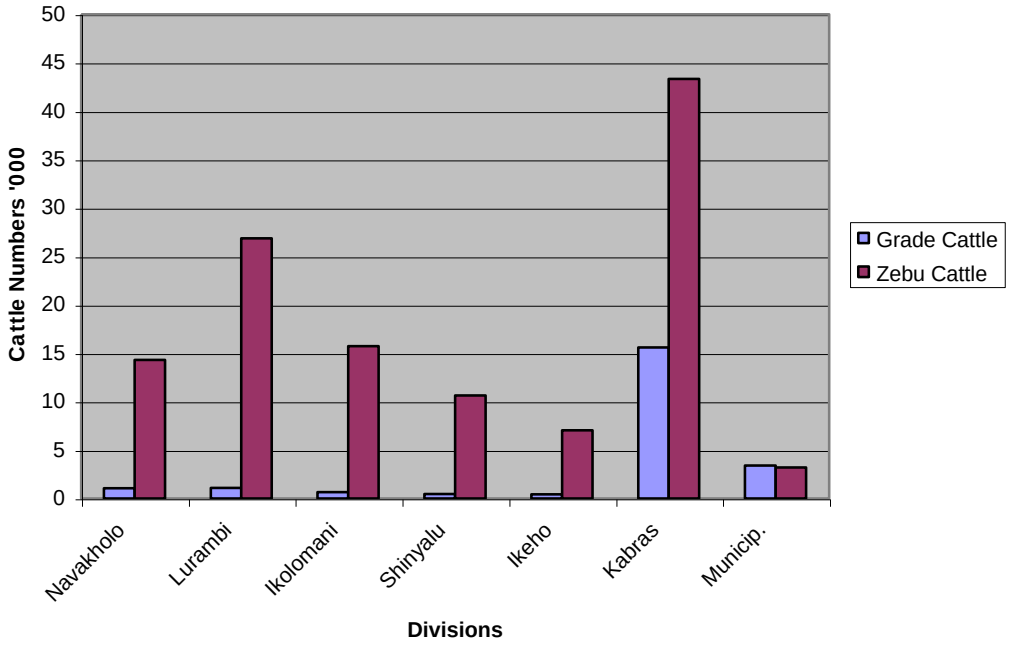
Kakamega District

Kakamega District borders Vihiga District to the South, Nandi and Uasin gishu Districts to the East, Trans nzoia and Lugari Districts to the North and Bungoma, Busia, Butere/Mumias and Siaya Districts to the West. The District lies between longitudes 340 20' and 350Eand latitudes 00 15' and 10N of the equator. Administratively, it is divided into seven (7) Divisions, namely; Municipality, Ikolomani, Lurambi, Navakholo, Ileho, Shinyalu and Kabras; 23 Locations and 82 Sub-locations.

The District covers a total land area of 916 square kilometres of which 879 sq. Km. is arable land and 37 sq. Km. is covered by Kakamega Forest. The District has about 100,760 farm families with an average family size of 8 persons per household and a mean farm size of 0.8 hectares (1.5 acres).

The total cattle population in the District is estimated at 144,275 (District Annual report, 1998). Out of this, less than 20% are dairy cattle. The population of dairy cattle has however been on the increase in all the Divisions within the District since 1996 except in Shinyalu division, where the population dropped from 1,010 in 1996 to 452 in 1998, because of an outbreak of Foot and Mouth disease. The population of zebu cattle during the same period has also been on the increase, with considerable increases in Ikolomani and Lurambi Divisions. It is only in the Municipality Division where there has been a big drop in the zebu cattle population from 5,766 in 1996 to 3,201 in 1998. This is primarily because of the pressure on land for urban settlement as a result of human population increase, hence cattle especially high value (grade) are reared under intensive cattle production systems; zero grazing and semi-zero grazing in few isolated cases. Kabras Division leads in the number of cattle, both graded and zebu and is followed by Lurambi, Ikolomani and Navakholo Divisions respectively.

Figure 4. Cattle Population ('000) in the Divisions of Kakamega District (1998).



Source: MoARD Kakamega District Annual report (1998).

Vihiga District

Vihiga District was curved out of Kakamega District in 1991 and now forms one of the eight Districts in Western Province. It borders Kakamega District to the North, Nandi District to the East, Kisumu District to the South and Siaya District to the South West. The District lies between longitude 34^0 30' East and 35^0 0' East and between longitude 0^0 and 0^0 15' North. The Equator cuts across the southern tip of the District. The District is 33 km wide from East to West and 19 km from North to South and occupies a total land area of 408 sq. km (District Development Plan, 1997-2001).

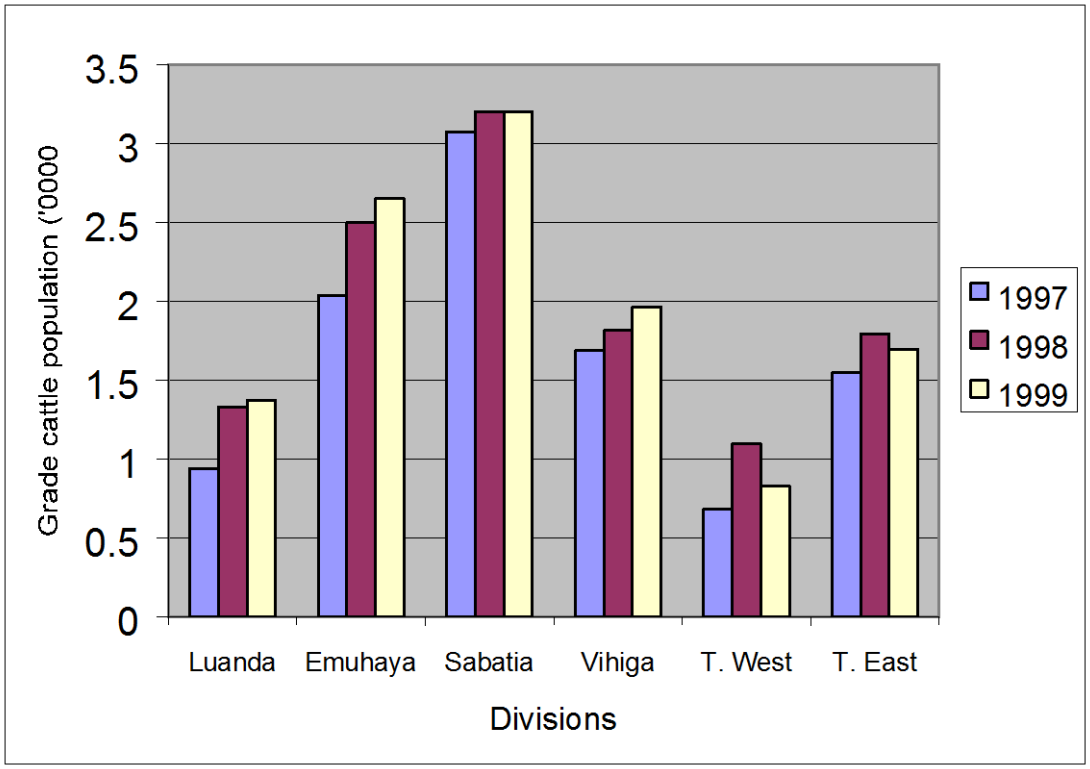
The District has about 75,000 farm families, with an average population density of 1050 persons per sq. km. The average family size is 8 persons per household with a mean farm size of 0.6ha (1.2 acres) (1989 Population Census Report). Administratively, the District is divided into six Divisions namely; Emuhaya, Luanda, Sabatia, Tiriki East, Tiriki West and Vihiga, that are further sub-divided into 27 Locations and 115 sub locations.

Due to lack of good quality feeds for exotic dairy cattle and their crosses and small size of land holdings, most farmers in the District still prefer to keep the local stock. There is however a shift towards intensive cattle production systems.

Ministry of Agriculture Rural Development reports from Vihiga District MoARD Annual Reports 1997-1999) shows that the cattle population in the district rose from a total of 135,350 in 1997 to 146,492 in 1998, representing an increase of about 8% (Appendix 1). By 1999, there was however a drop of 9% in the cattle population to a total of 133,109, the drop being mainly in the total population of Zebu cattle compared to the Grade cattle (Appendix 1). The major drop occurred in Sabatia division. Implying that there has been a departure from keeping indigenous breeds of cattle by some farmers in the District mainly due to the limited land space and the realization of benefits of keeping high value stock. There is no land in the District for communal grazing and the zebu cattle kept are restricted to owner's plots.

Figure 5 shows a steady increase in the population of grade cattle in Emuhaya and Vihiga Divisions between 1997 and mid 1999. The population of grade cattle as a proportion of the total cattle numbers has however fluctuated during the same period in the other Divisions of the District. The numbers of grade cattle in Sabatia Division increased more by 1999 compared to the other Divisions, probably due to the increase in dairy development projects

Figure 5: Grade cattle population ('000) trends per Division in Vihiga District (1997-1999)



Source: MoARD Vihiga District Annual Reports (1997-1999).

2.2 Cattle breeding programmes within the region

The main breeding systems are by natural service either using improved bulls introduced by various cattle development projects or the bulls and Artificial Insemination.

2.2.1 Artificial Insemination

This is very popular with farmers in the region and the service is being rendered by both the government and private groups. Artificial insemination services in the region have, however, not fared well because farmers opt to use natural service due to costs involved. The farmers find AI services expensive at the range of KSH 300 to 2000 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 the Livestock development project (LDP), Heifer Project International (HPI) and a few other Non governmental organizations (NGO) projects. Their impact for improving the dairy genotype is, however, so far low. The tables 5 and 6 below show the recorded inseminations for each scheme as offered by both the government and private groups in Vihiga, Bungoma, Nandi and Kakamega Districts, while table 7 shows semen distribution by cattle breeds in the same Districts.

Table 5. Government recorded inseminations per scheme (1998).

Station	Grade Cattle		Zebu Cattle		Total		Grand Total
	First service	Repeat	First Service	Repeat	First Service	Repeat	
Kakamega	556	280	44	08	600	288	888
Bungoma	583	260	103	13	686	273	959
Vihiga	682	138	116	34	788	174	963
Nandi	498	144	-	-	498	144	642
Total	**2319**	**822**	**263**	**55**	**2572**	**879**	**3451**

Source: Western Province. AI report, 1998.

Table 6. Private schemes recorded inseminations (1998).

Scheme (District)	Grade Cattle		Zebu Cattle		Total
	1st Service	Repeat	1st Service	Repeat	
MOCO (Kakamega)	938	258	136	48	1380
KARI (Kakamega)	18	8	nil	nil	26
Esabalu (Vihiga)	179	20	14	-	213
Lessos FCS (Nandi)	529	103	-	-	632
Kamno FCS (Nandi)	347	101	-	-	448
Tambache Malugei (Nandi)	69	1	-	-	70
Kopoch Farm	27	1	-	-	28
Total	**2107**	**498**	**150**	**48**	**2849**

Source: Western Province. AI report, 1998.

Note: Private artificial insemination services recorded for Nandi District excludes those offered by the University of Eastern Africa (Baraton), Kibabet Tea Estate and the American Breeding Services (ABS) based in Sabatia Division of Vihiga District.

Table 7. Semen distribution by cattle breed in Bungoma, Vihiga and Kakamega Districts (1998).

Station	Ayrshire	Friesian	Guernsey	Jersey	Boran	Sahiwal	Brown Swiss	Total
Vihiga	641	493	635	507	nil	nil	nil	2270
Bungoma	409	399	283	175	nil	7	nil	1339
Kakamega	357	206	269	56	nil	nil	nil	888
Nandi	275	250	76	41	nil	nil	nil	642
Total	**1682**	**1348**	**989**	**779**	**nil**	**7**	**nil**	**5239**

Source: Western Province. AI report, 1998.

However, a number of problems hinder proper delivery and expansion of artificial insemination services in the region and these include;

a) Lack of proper transport modes and poor road networks limiting accessibility to farmers on time after heat detection.
b) Lack of A.I containers i.e. they are not readily available in the market and the ones which are there are expensive hence not easily affordable.
c) Acquisition of A.I resources (semen) from C.A.I.S in Nairobi i.e. it is difficult to get these resources from there due to the distance and this increases the insemination costs rendering it unaffordable to most farmers.
d) Insufficient knowledge on management of fertility of dairy cows by the farmers.
e) Few technically competent inseminators employed by the groups.

2.2.2 Bull Schemes

There are quite a number of bull schemes established by the government through Livestock Development Project in Bungoma, Vihiga and Kakamega Districts to help improve the genetic potential of animals for increased milk production. In addition there are also privately owned bulls for the same.

2.2.3 Contract Mating

Mukumu farm in Kakamega District has Guernsey animals and operates a contract-mating scheme with semen imported from the United States of America (U.S.A) through the Central Artificial Insemination Station (C.A.I.S) in Nairobi. The imported semen is used for contract mating dams selected by the bull purchasing committee on the farm. The farm was established in 1927 by the Catholic Church and sells Guernsey animals to farmers in the region.

2.2.4 Progeny Testing

Bukura Farmers Training Centre and Bukura Agricultural College in Kakamega District and Mabanga Farmers Training Centre in Bungoma District carry this out on Aryshire breed of cattle, though on small scale.

2.3 Cattle Diseases

Cattle Diseases and pests have been identified as a major constraint to increased cattle productivity in the region (NARPII inception report, 1995). To realize optimum productive and reproductive performance from these cattle, it is vital to enhance efforts on disease control and pest management. Currently, the region is characterized by poor disease control strategies resulting into high morbidity and mortality of both the young and adult stock (District Annual reports, 1998). This is largely due to the high cost of veterinary drugs and deterioration in the quality of animal health care delivery systems in the region over the years.

The most prevalent cattle diseases in Bungoma, Kakamega, Nandi and Vihiga Districts include:

a) Tick Borne Diseases - East Coast Fever (ECF), Anaplasmosis, Babesiosis, Heart water and Black Quarter.
b) Worm infestations.
c) Nutritional and Metabolic disorders - Milk fever, Bloat and Avitaminoses.
d) Lumpy Skin Disease (LSD).
e) Mastitis.
f) Respiratory Disease ie Pneumonia, especially in young stock.
g) Helminthiasis - both worm and liver fluke infestation.
h) Foot and Mouth Disease (FMD).

Most communal cattle dips are non operational after the government withdrew their funding and left them to community initiative and management. Also high costs of accaricides has rendered them unaffordable by most small scale rural farmers in these areas. There are also no strategic and pre-determined vaccination campaigns against the various notifiable cattle diseases. It is therefore necessary to adopt an integrated approach (making optimal use of all the available control methods in a flexible way adopted to the local circumstances and to economic reality) in the management of these cattle diseases and pests. Also integration of locally available materials and technology (Indigenous Technical Knowledge) in control and treatment of these diseases is bound to reduce the costs and enhance sustainability.

2.4 Cattle feed resources and utilization

Dairy farming in RRC-Kakamega mandate region is mostly practiced under rain-fed conditions. The uneven rainfall distribution pattern across the agro-ecological zones influences the availability and quality of forages. Severe feed shortage in the region is experienced during the dry seasons between the months of December and February and during this time there is increased concentrates (bran, dairy meal, local brewers waste, molasses and spoilt maize) and crop by products (Stover, banana pseudo stems, sugar cane tops, sweet potato vines, bean hauls etc) usage. However during the wet seasons dairy cows are constrained by low intake owing to the high moisture content of grass based diets even though total available dry matter may be adequate in nutritional value. Smallholder dairy farmers in the region rarely practice any form of feed (pasture and fodder) conservation during this time when there are plenty of forages.

Dairy producers in high rainfall areas of the region depend almost entirely on Napier grass as the feed resource during the wet season and on crop residues during the dry season. Little commercial concentrates are used due to the high cost and in, some areas their unavailability. Technology to introduce forage legumes to improve quality and utilization of these grasses has not been adequately disseminated in most areas.

Currently, the pressure on land is increasing due to sub divisions and hence the feed resource production will need to be intensified to sustain dairying. Certain areas are characterized by frequent night frosts, especially during the cold months, others are water logged in rainy seasons, whilst other areas have low and erratic rainfall with frequent droughts. Adopted forages of high productivity need to be developed for these specific ecological niches. Systems of utilization to maximize nutrient intake by dairy cows from these feed resources are equally lacking.

It is therefore necessary to adopt technologies that could be used to improve on the feed quality and increase herbage production per unit land for the dairy enterprise. Ideally, the concept should be to provide adequate nutrition to the dairy cow, without a net reduction in food and/or cash crop production.

2.4.1 Vihiga District

The District is characterized by ever diminishing land sizes per household as a result of rapid human population increase and this remains a major constraint to cattle production. The forage resource base of the District continues to decline as the available land is put under crop production, both cash (i.e. tea, coffee) and food crops (i.e. maize, beans) and this limits the expansion of the dairy herd. There is minimal acreage of land under natural pastures (improved and unimproved) and in most cases animals will be found tethered or grazing along road reserves.

There have been fluctuations in the acreage of land under Napier grass over the years since 1992 (table 8). There is also quite a sizeable proportion of land under sweet potatoes, and this form a supplementary feed resource for the animals especially during the dry season between the months of December and February. There is thus a need to emphasize to farmers on the need for forage conservation to be fed to the animals during the dry season, and also on appropriate techniques of increasing herbage production per unit area of land without a net reduction in food and/or cash crop production.

Table 8. Fodder production trends in Vihiga District (1992- 1999)

Year	Napier (Acres)	Fodder trees (No. of stems)	Desmodium (Acres)	Sweet potatoes (Acres)
1992	2,431.4	17,726	5.5	
1993	2,561	26,725	17.3	
1994	2,897	46,996	20.5	
1995	3,031	77,850	23.7	
1996	3,159.8	64,030	23.0	
1997	3,938	89,554	22.9	
1998	2,630	107,900	11.5	
Mid 1999	2,920.5	150,600	19.5	187

Source: MoARD. Vihiga District Annual Reports, 1992 - 1999.

2.4.2 Kakamega District.

The District like Vihiga District is also characterized by diminishing land sizes over the years due to increasing human population hence putting pressure on the available land. There is very little land under pastures and fodder production in Kakamega District as much of it has been placed under cash and food crop production. However, Kabras Division of the District has a large proportion of land under natural pastures and fodder (table 9), and this explains why there is a high cattle population in the Division as compared to the other Divisions of the District. Forage conservation has also not been reported in the District and the need for this also has to be emphasized to the farmers.

Table 9. Fodder and Pasture Production in Kakamega District (1998)

Division	Napier grass (acres)	Desmodium	Sweet potato vines	Fodder trees (stems)	Improved pastures (ha)	Natural pastures (ha)
Ileho	186	-	-	4,500	25	464
Navakholo	176	-	-	2,500	-	1340
Shinyalu	235	-	-	900	40	370
Kabras	141	0.75	20	895	-	12,724
Lurambi	252	-	25	1,300	4.5	359.5
Municipality	270	-	-	-	4	104
Ikolomani	309	-	-	3,000		
Total	**1,569**	**0.75**	**45**	**13,155**	**109.5**	**15,397.5**

Source: MoARD. Kakamega District Annual report, 1998.

2.4.3 Bungoma District.

Bungoma District has relatively large farm sizes per household and hence a large proportion of the land is still under natural pastures. However, there is a move towards intensive or semi-intensive livestock management. This necessitates supplementation with improved pastures, fodder legume trees and grasses and also silage and hay. Some farmers in several Divisions of the District and especially in Webuye and Tongaren conserve excess forage in the form of hay and silage to be fed to the animals during times of forage scarcity (table 10), though there are some divisions of the District like Chwele, Kimilili and Sirisia where forage conservation has not been reported.

Tongaren and Kanduyi divisions of the District have the highest acreage of land under pastures and fodder production as compared to the other division with Webuye having the least (table 3). It is also because of this that the two Divisions also lead in milk production in the District. Comparatively, the District has witnessed fluctuations in the availability of natural pastures over the years since 1992, though the acreage under improved pastures and fodder including fodder trees has been increasing steadily since 1992 (Table 11).

Table 10. Pastures and Fodder Production per Division in Bungoma District (1998).

Division	Natural Pastures (Ha)	Improved Pastures (Ha)	Improved Fodder - Napier (Ha)	Fodder Trees (Stems)
Chwele	1,500	15	54.40	3,250
Kimilili	5,090	9.5	115.00	7,120
Tongaren	10,227	270	395.50	4,346
Nalondo	2,142	73	105.00	3,480
Sirisia	4,000	90	94.40	4,400
Webuye	844	35	228.00	2,090
Bumula	6,930	250	402.00	4,509
Ndivisi	1,960	6.0	71.28	3,560
Kanduyi	8,020	320	348.00	5,810
Total	**34,473**	**1070**	**1813.58**	**38,565**

Source: MoARD. Bungoma District Annual Report, 1998.

Table 11. Comparative pasture and fodder availability in Bungoma District (1992 - 1998).

Year	Natural pastures (ha)	Improved pastures (ha)	Napier grass (ha)	Fodder trees (stems)
1992	42,175	700	450	17,195
1993	43,370	852	680	21,000
1994	37,250	732	710	14,920
1995	37,300	792	899	20,520
1996	49,960	688	991	29,115
1997	48,320	722	1,323	32,100
1998	40,713	1,100	1,800	38,562

Source: MoARD. Bungoma District Annual Reports, 1992 - 1998.

2.4.4 Nandi District.

Natural pastures occupy a large acreage of land in Nandi District, and this coupled with the fact that land sizes per household are also relatively large explains why cattle management is mostly extensive grazing. There are also improved pastures in the District composed of a mixture of Rhodes grass and Nandi setaria grass and this supplements the natural pastures for grazing. Land acreage under Napier grass in the District has also been fairly constant over the years since 1996. Fodder legume trees and grasses, sweet potato vines, sunflower and oats,

even though on a marginal scale, are also grown by the farmers in the District for supplementation to cattle. There is no evidence of forage conservation in the District, therefore, training of farmers on forage conservation in times of plenty to be fed to animals during times of pasture scarcity, and on ways of improving the quality and quantity of these pastures without necessarily increasing land acreage under them is essential for better livestock nutritional management.

Table 12. Pasture and fodder production trends in Nandi District (1996-1998).

Pasture/Fodder Type	1996 (ha)	1997 (ha)	1998 (ha)
Napier grass	1332	1340	1336
Sweet potato vines	20.01	29.03	74
Mixture of Rhodes and Nandi setaria grasses	701.5	652	686
Pure stand Rhodes grass	-	-	-
Natural pastures	111,140	103,172	106,543
Fodder trees (Sesbania and Leucaena)	14	3.8	
Lucerne/Desmodium	14.4	15.7	8
Sunflower	-	-	6
Oats	-	-	12

Source: MoARD. Annual Reports: 1996 - 1998.

2.5 Milk production and marketing

Milk remains the major source of nutrition in terms of animal protein supply to many households in Western Kenya and the country as a whole (MoARD, 1996). Inappropriate animal management and nutrition at the smallholder farm level limits increased milk production and supply from the dairy industry. Lack of proper milk handling, storage/cooling, processing and marketing channels/facilities worsens the situation. The increased demand for milk and milk products prompts a need for action towards increased dairy production through the use of high-grade cattle and exotic crosses. Nandi and Uasin Gishu Districts in the Rift Valley Province remains the major suppliers of milk to most Districts in the Western Kenya and Nyanza regions of the country due to frequent shortages of milk in these areas.

Milk marketing in Western Kenya is mainly informal through hawking, milk bars, etc with liberalization of milk marketing in 1992 and the lifting of urban milk market monopoly previously enjoyed by the Kenya Co-operative Creameries (KCC). There are a few dairy farmers co-operative societies that still exist in the region to market members milk, after most collapsed or are on the verge of collapse. Other milk market outlets available for farmers in some areas within the region include private processors such as Kitinda, Nasyanda and Magharibi dairies in Bungoma District and Kaptumo, Kaigat, Kamnon and Lessos co-operative societies in Nandi District. They source milk from farmers for processing and

marketing. KCC is still operational in areas like Nandi where there are two cooling plants in Kapsabet and Lessos.

Formal milk marketing channels like co-operative societies and processing agencies are less developed in the region as a result of managerial problems with most being un-operational or operating under capacity. This results into a lot of milk spoilages and exploitation of small-scale milk producers by middlemen. The milk disposal outlets include household consumers, institutions, hotels and restaurants with the price ranging between Kshs 25 to 30 per litre depending on seasonal fluctuations in milk supply. Quality control measures undertaken by the Dairy farmers co-operative societies prior to milk intake include use of a lactometer and match test in some cases. The main constraints that have been cited to hinder the progress of these co-operative societies include managerial problems and competition from informal milk market agents.

2.5.1 Vihiga District.

Low acceptability of improved cattle breeds and AI services by smallholder farmers due to costs involved in various parts of the District has tended to lower the production of milk. Some farmers, for instance, have continued to keep zebu cattle as opposed to the improved dairy cows. This is largely attributed to the socio-cultural attachment to the breeds ie dowry payment, hardiness, prestige etc. This is despite the fact that improved breeds have higher milk yields, which can support setting up of milk based industries, for processing fresh/fermented milk, yogurt, ghee, butter, cheese etc. These would easily be marketed within the region and offer employment opportunities and a chance for appropriate skills development for the District's population in the new firms.

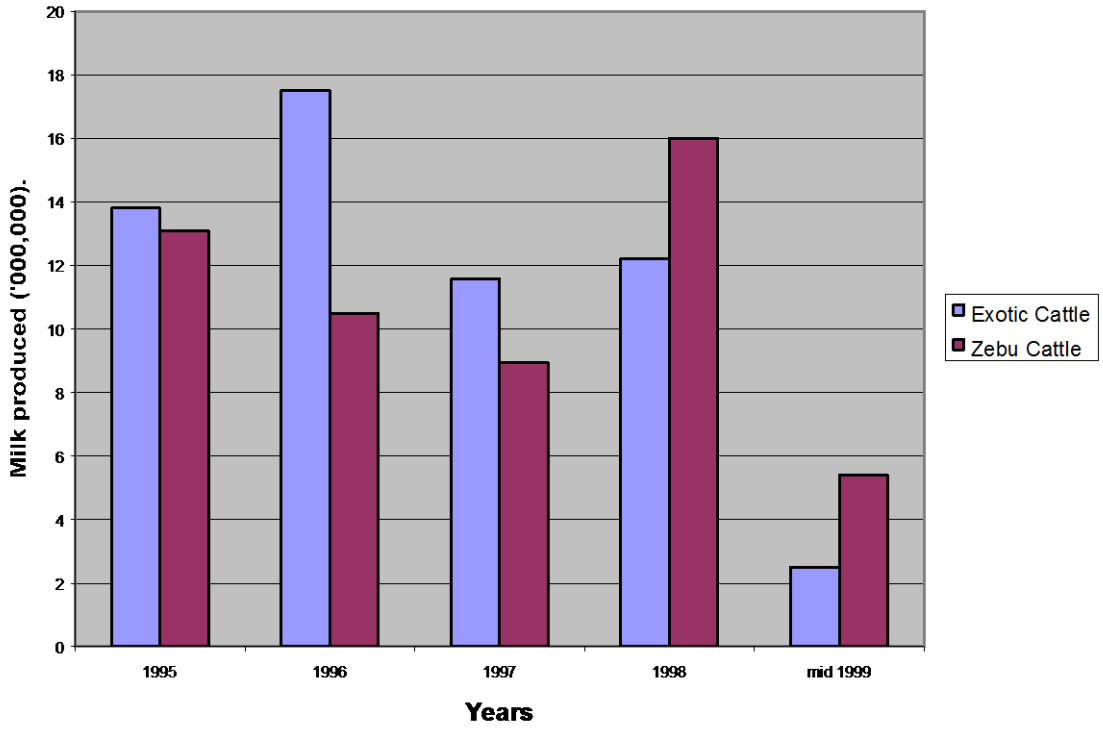
Lack of quality animal feeds aggravates the situation. Market skills and information are poorly developed in that even within the district, people tend not to know areas with effective demand for their milk products. Coupled with lack of storage facilities and cooling plants prices tend to fluctuate seasonally, with very low prices being offered to farmers for their produce. There is also a high demand for credit in the District for dairy development, however, the District has limited credit facilities and lending institutions, and where available, the demand for collaterals such as title deeds and high interest rates on loans offered to the farmers.

There have been high fluctuations in milk production from both the dairy and zebu cattle in Vihiga District over the period 1995 to 1999 (District Annual Reports, 1995-1999). These fluctuations could be attributed to seasonality in pasture production, a major feed resource for cattle in the region, and the need for more land for food crop production than livestock production, leading to less land under pastures and fodder production. The District has also witnessed minimal growth in cattle numbers over the years as a result of reduced feed supply due to land presure. Sabatia Division of the District had the highest milk production levels by mid 1999, with Tiriki East Division having the least. This may be due to the presence of many research and extension activities on dairy production in the Division leading to more uptakes of dairy technologies.

Milk processing and marketing is also not well developed in the District and this limits the expansion of the dairy industry. This is because of the fewer number of dairy animals kept and managerial problems of the two co-operative societies i.e. Vihiga and Sabatia that had been formed to market farmers' milk. Most of the milk produced is consumed locally within the District, though however, this is not always enough and more has to be imported from the neighboring Nandi District that has surplus. Milk in the District is disposed off informally

through hawking and farm gate sales. Formal milk marketing is through Bunyore and Vihiga co-operative societies, though these are experiencing a share of managerial problems. There is also however a private milk processor, Luanda dairy farm that processes on small scale and sells fresh milk, yogurt, mala, milk shake and cheese.

Figure 6. Milk production trends in million litres for Vihiga District (1995 - Mid 1999).

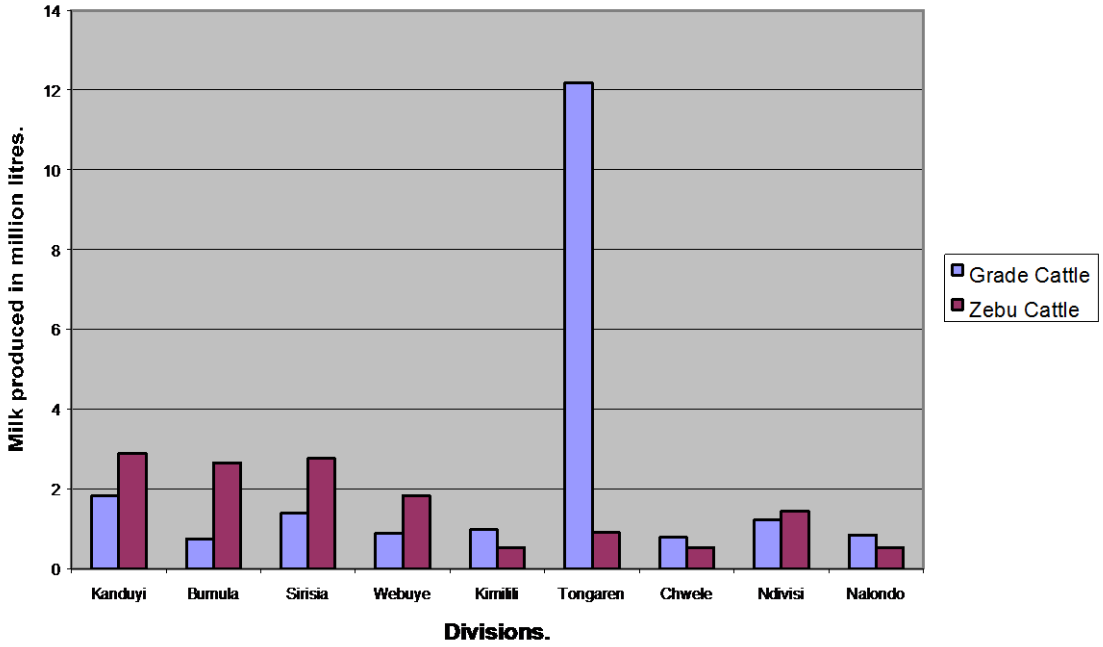


Source: MoARD Vihiga District Annual reports (1995-1999).

2.5.2 Bungoma District.

Milk production in Bungoma District has been fairly constant over the years since 1995 (Appendix 1). Tongaren Division of the District had the highest milk production levels over the same period with the other division having relatively high and comparable milk production levels. Milk production from dairy (grade) cattle was high in Tongaren Division as compared to the other Divisions of the District (figure 7). There is also quite a number of milk processing co-operative societies in the District as shown in table 13 below. These form the formal milk marketing channels in the District, though, however milk is also marketed informally through hawking and farm gate sales.

Figure 7. Estimated milk production in million litres for each division in Bungoma district (1998).



Source: MoARD Bungoma District Annual Report, 1998.

Table13. Milk Processing Co-operative Societies in Bungoma District (1998).

Society	Milk handled (Litres/day)	Buying Price (Kshs/litre)	Consumer Price (Kshs/litre)	Products
Kitinda	27,000	20	40	Mala
Sang'alo Institute	21,600	20	30	Yoghurt
Nasyanda Dairy	24,186	20	28	Mala, Fresh milk
Magharibi Dairy	21,890	20	30	Fresh milk
Kimilili Mini Dairy	18,790	20	30	Fresh milk
Lutonyi Dairy				Fresh milk, Mala
Moonstar Dairy				Mala
Migide Dairy				Mala, Fresh milk, Yogurt.

Source: MoARD. Annual Report, 1998.

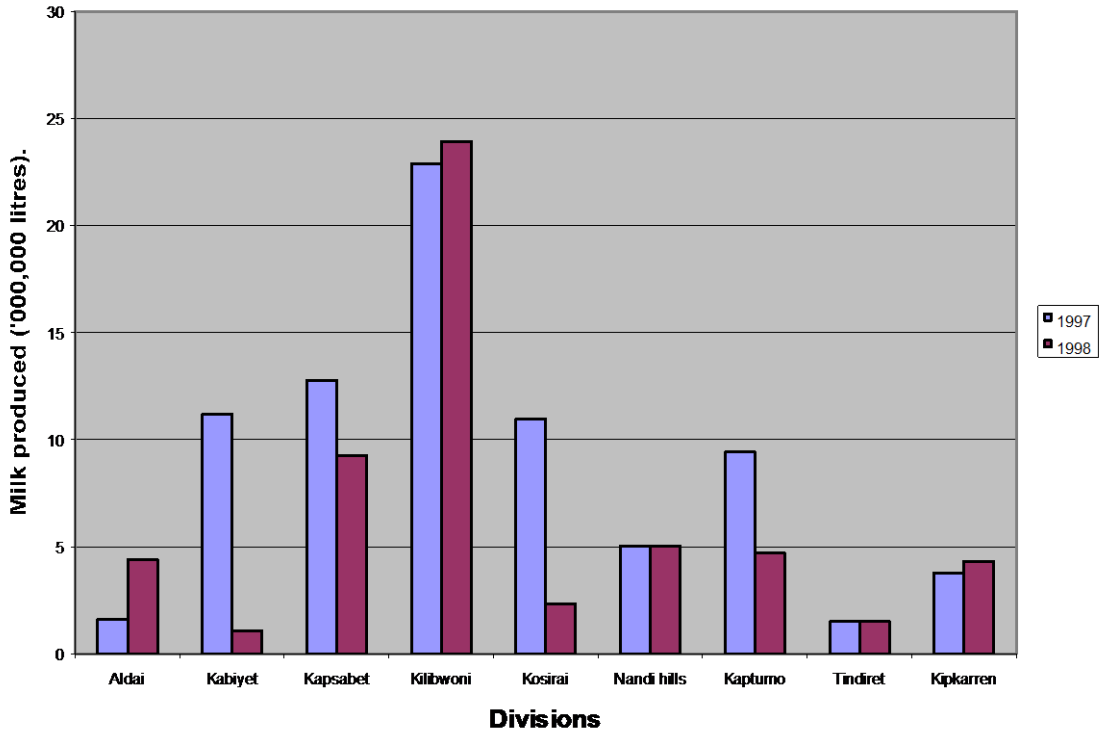
2.5.3 Nandi District.

The dairy industry is well developed in Nandi District and milk marketing is quite organized as compared to the other Districts in Western Kenya. Also the milk production levels are

high. Kilibwoni and Kapsabet Divisions of the District had the highest milk production from dairy cattle between 1997 and 1998 (Appendix 2), though there was a slight increase and drop in milk production from the two divisions respectively over the same period (figure 9). There was a major drop in milk production in Kosirai and Kaptumo Divisions of the District over the period between 1997 and 1998 (figure 8). Aldai Division of the District experienced a major increase in milk production from both dairy and zebu cattle between the same period.

Generally there was a major drop in milk production from dairy cattle in the District from 74.2 million litres in 1997 to 42.4 million litres in 1998, though the milk production from zebu cattle increased tremendously over the same period (Appendix 3).

Figure 8. Milk production (in million litres) trends for each division in Nandi District.



Source: MoARD Nandi District Annual Report, 1997-1998.

Milk Processing and Marketing Channels in Nandi District.

1. Kenya co-operative creameries (KCC) - has two cooling plants at Kapsabet and Lessos.
2. Lessos co-operative society - markets milk to KCC and has A.I service scheme.
3. Kamnon co-operative society - it operates in the central Division and is multipurpose, though it has A.I service scheme and markets milk.
4. Kaigat co-operative society - serves Nandi and Uasin - Gishu Districts and has an A.I service scheme.
5. Kaptumo co-operative society - it is multipurpose though processes and sells fermented milk (mala).

2.6 Constraints to dairy cattle production in the region

Experience within the Regional Research Centre mandate area reveals that biophysical and socio- economic constraints limit the productive and reproductive potential of the dairy herd on smallholder farms even though the soils and climate of the region provides a suitable environment for intensive crop and dairy production. The major constraints include:

a) Inadequacy and poor quality feeds.
b) Unavailability of suitable dairy breeds.
c) High levels of mortality due to diseases and parasites.
d) Poor management/husbandry practices.
e) Reluctance by farmers to direct labour and management efforts from other farm activities to dairy production.
f) Lack of cash for capital investment in basic infrastructure required for dairy production.
g) Marketing problems for milk and milk products (poor milk prices, delayed payments, lack of market etc.)

3.0 LIVESTOCK RESEARCH AND DEVELOPMENT PROGRAMMES IN THE REGION

The table below shows Research/Extension activities involved in livestock production in the region.

Activity	Present situation	Objective	Level of collaboration with the MOA/Dept.	Site of operation	Organization responsible
1. On-farm trials on dry season feeding strategies for dairy cows. Duration: 1999-2001	Demonstrations, on simple homemade ration formulations already conducted. 22 farmers going on with the trials.	Sustain milk production at economical levels even in times of drought. Sustain other dairy cow performances by provision of quality feeds.	-PRA in study areas -Planning and review meetings. -Farmers demonstration of -Implementation of other planned activities like following ups.	Vihiga	KARI
2. Use of dual purpose goats as alternative source of milk.	Farmers training not yet conducted. But 64 farmers on trials, 46 impact farmers registered.	-Provide alternative source of milk to farmers. -Improve husbandry practices for the goat.	-Not yet streamlined - But the depart. Of livestock prod. Pursuing on efforts to improve this.	Vihiga	Lagrotech.
3. Trials on Tumbukiza technology on Napier establishment.	Three cut of ten farmers doing well with the technology.	-Provide alternative to conventional way of Napier establishment. -Compare need requirement on husbandry practices for the two methods.	-Follow-ups -Review sessions.	Vihiga Siaya	KARI
4. Vaccinations against common diseases in indigenous birds.	-Little impact in cluster area. -But practicing farmers realizing	-Create awareness on poultry vaccination.	-Extension staff in the field involved in all activities.	Vihiga Kakamega	KARI

	improved turnover.			Siaya Bungoma	
5. Sustainable natural resource management	-PRA already done -Farmers identified	Broadly, management of natural resource base with a view of improving production per unit area.	Staff both the MOA and KARI involved at all levels of operations.	Vihiga	KARI/ICRAF - AHI (African Highland Initiative)
6. Development of small scale fish farming	Farmers identified and already to engage in fish farming.	-Provide a source of income -Improve nutritional status of participating household.	Identification of farmers demonstration in collaboration with the fisheries department	Vihiga Busia Bungoma	LBDA
7. Provision of credit to organized groups and application of organic farming methodology and marketing of farmers produce.	Farmers already sensitized on the operations of the groups.	Assist farmers in identification and management of small-scale project at the above level.	Not yet quite streamlined	Vihiga Kakamega Bungoma Siaya	Africa Now/Care Kenya/SCODP
8. Provision of cows. Creation of alternative -A.I service approach	-Farm census on dairy cows to be done. -Office in place at the ground.	-Provision of soft credit for dairy production. -Provision of employment opportunities and A.I Services	To be through planning and execution of activities. Not yet very clear	Vihiga Butere/Mumias	ABS/HPI

4.0 LIVESTOCK EXTENSION SERVICES WITHIN THE REGION

4.1 Ministry of Agriculture and Rural Development (MoARD)

A) Livestock Development Project (LDP)

This project started in 1991 and has been running in phases. Phase 1(1991-1994), Phase II (1995-June 1998) and Phase III was from July 1998 and is still on going. This project is co-funded by both the Finish Government and the Kenyan Government and is run under two ministries, the Ministry of Agriculture and Rural Development and the Ministry of Co-operative development. In western Kenya it operates in all Districts. However Nandi District does not have any component of the project.

The main objective of the project is to increase milk production in milk deficit areas. The main activirty under the project is upgrading of the local cattle by use of grade bulls (Bull Schemes) through natural services. They also carry out disease control (dips rehabilitation, issuance of spray pumps on cost sharing basis and community maintained animal health assistance), forage (fodder and pasture) production through establishment and maintenance of bulking plots and nurseries, training of farmers and staff, cow from cow rotation scheme under the women groups and support of dairy co-operatives on milk handling, marketing and training.

4.2 Non-Governmental/International Organizations (NGOs)

The following is a list of other organizations working with the farmers in the region towards improving Livestock Production and other Agricultural activities.

Organization	**District**	**Area of Interest**
Dorcas Project International	Kakamega	Dairy
FARMESA	Kakamega	Dairy
Heifer Project International	Kakamega, Vihiga, Butere/Mumias	Poultry
1. Mumias Out-Growers	Kakamega, Bungoma, Butere/Mumias	Dairy
2. The Kenyan Indigenous Forest	Kakamega	Dairy
3. Organic Matter Management Network	Kakamega, Vihiga	Dairy/Beekeeping
4. CARD-ASSETS	Kakamega	Training

5. ILRI - East Coast Fever Immunization project by Dr. Kiara in Kakamega and Butere/Mumias Districts. The project aims at developing ECF Vaccines by collecting biophysical data with regard to East Coast Fever resistance within the area of operation
6. Lake Basin Development Authority operating in the Bungoma is involved in multiplication of dairy cattle through sale of heifers and bulls to the farmers at 70% of the cost while the farmer provides the remaining 30%.
7. Kitinda dairy in Bungoma is run by a private businessman and undertakes Napier establishment for farmers.
8. Kaputanayi co-operative society in Bungoma operates as a non-governmental organization and receives donor funds to purchase dairy animals for the farmers.
9. Mumias Out-growers Company (MOCO), a sugar cane growing farmers co-operative society, operates in Kanduyi and Bumula Divisions of Bungoma district and apart from

offering AI services to farmers, gives them heifers and cows and also materials for zero-grazing units construction and spray pumps.

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Appendix 1. Estimated Milk production and Trends in Bungoma District per Division (1995-1997)

	Litres of milk produced/Year.				
Division	**Grade Cattle**	**Zebu Cattle**	**Total (1997)**	**1996**	**1995**
Kanduyi	1,422,000	2,865,600	4,278,600	5,147,802	5,983,000
Bumula	582,000	2,650,590	3,232,590	3,860,851	3,990,000
Sirisia	1,090,000	2,773,440	3,863,440	3,539,114	319,200
Webuye	744,000	1,906,200	2,650,200	4,182,589	6,783,000
Kimilili	902,400	517,104	1,419,504	4,504,326	5,985,600
Tongaren	16,056,000	8,887,328	16,943,328	8,043,440	9,975,000
Chwele	720,000	505,440	1,225,440	-	-
Ndivisi	360,000	1,360,800	1,720,800	-	-
Nalondo	826,800	526,122	1,352,922	2,895,638	3,990,000
Total	**22,703,200**	**13,983,624**	**36,686,824**	**32,173,760**	**39,000,000**

Source: MoARD. Annual reports, 1995 - 1998.

Appendix 2. Milk production levels in litres per Division in Nandi District (1997-998).

	1998		**1997**	
Division	**Dairy cattle**	**Zebu cattle**	**Dairy cattle**	**Zebu cattle**
Aldai	3,298,637	1,099,646	729,150	863,040
Kabiyet	794,524	261,841	11,141,130	38,040
Kapsabet	6,955,039	2,318,346	12,536,090	232,190
Kilibwoni	17,945,715	5,981,905	21,551,390	1,327,860
Kipkarren	3,244,320	1,081,440	3,719,275	65,610
Kosirai	1,755,000	585,000	10,914,820	47,385
Nandi hills	3,786,000	1,262,000	4,336,990	711,500
Kaptumo	3,525,000	1,175,000	7,800,275	1,621,300
Tindiret	1,118,346	372,782	1,472870	29,160
Total	**42,422,585**	**14,140,860**	**74,201,990**	**4, 936,085**

Source: MoARD. Annual report, 1998.