STRATEGIC AND VALUE CHAIN STUDY OF THE SMALLHOLDER DAIRY SECTOR IN CENTRAL KENYA

FINAL REPORT

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SUBMITTED TO THE KILIMO TRUST

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LIST OF ABBREVIATIONS

AI	:	Artificial Insemination
BDS	:	Business Development Services
CAIS	:	Central Artificial Insemination Station
CBO	:	Community Based Organizations
COMESA	:	Common Market for East and Southern Africa
DFID	:	Department for International Development
DFSHG	:	Dairy Farmers Self Help groups
EADDP	:	East African Dairy Development Programme
EAC	:	East Africa Community
ERS	:	Economic Recovery Strategy
GDP	:	Gross Domestic Product
ICIPE	:	International Centre for Insects Physiology and Ecology
IFC	:	International Finance Corporation
ILRI	:	International Livestock Research Institute
JKUAT		Jomo Kenyatta University of Agriculture and Technology
KAPP		Kenya Agricultural Productivity Project
KCC	:	Kenya Co-operative Creameries
KDB	:	Kenya Dairy Board
KDDP		Kenya Dairy Development Programme
KDPA	:	Kenya Dairy Processors Association
KEFRI	:	Kenya Forestry Research Institute
KELRI	:	Kenya Livestock Research Institute
KIKAMA	:	Kiharu Kangema and Mathioya Dairy Federation
MDG	:	Millennium Development Goals
MOLFD	:	Ministry of Livestock and Fisheries Development
NALEP		National Agricultural and Livestock Extension Programme
NGOs	:	Non-Governmental Organizations
NLBI	:	National Livestock Breeding Institute
SDP	:	Smallholder Dairy Project
SME	:	Small and Medium Enterprises
TA	:	Technical Assistance
UHT	:	Ultra Heat Treated milk
USAID	:	United Stated Agency for International Development

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EXECUTIVE SUMMARY

This smallholder dairy industry value chain study was sponsored by the Kilimo Trust and jointly carried out by Jomo Kenyatta University of Agriculture and Technology (JKUAT) Central Artificial Insemination Station (CAIS) and other partners. The purpose of this project was to study and document the challenges facing the smallholder dairy subsector in the central Kenya region and propose investment measures and modalities that can promote growth and competitiveness of the sector. In carrying out the dairy sector value chain study, a participatory approach and methodology was adopted comprising of a detailed desk review, field study, market analysis, focus group discussions and a stakeholders workshop.

Dairy Industry Background n Kenya

The study found out that the dairy industry plays an important role in the lives of people in central Kenya region and over 600,000 smallholder farmers derive their income from the sector. Central Kenya region comprising of over 36 administrative districts is now the leading producer of milk and is classified as a milk surplus area compared to the other eight provinces in the country. The region has an estimated dairy herd of 0.9 million cows and the total annual milk production is about 2.0 billion litres. The study estimates that the region earned close to 30billion Kshs from the value of milk produced and that 70% of this income went to smallholder dairy farmers.

The dairy industry value Chain

As documented in this study the smallholder dairy value chain comprises a production phase, collection and bulking, cooling/freezing/chilling, processing and packaging, transport and distribution, wholesale and retailing. Key activities at the production phase include keeping dairy cattle, growing fodder and feeding animals, milking and delivering the milk for local aggregation, husbandry practices like breeding, calf rearing and disease control. The key activities along the other parts of the chain includes weighing, quality assessment, aggregation, freezing, transportation, processing, packing, distribution and selling. The key players along the value chain include over 600,000 small scale dairy farmers, 0ver 80 dairy cooperatives and more than 200 Dairy Farmers Self Help Groups (DFSHGs). There are also emerging farmer federations bringing DFSHGs together for the purpose of delivering large milk volumes and offering other services to dairy farmers. The processing part of the chain is dominated by three milk processors (Kenya Cooperatives Creameries, Brookside, Dairies, and Spinknit) who control

over 70% milk intake. There are also at least four major cooperative societies which have successfully ventured into milk processing and marketing and over eight private processors whose combined milk intake is less than 30%. The chain in the area also comprises of approximately 10 efficient reliable and registered private milk traders each handling over 10,000litres of milk dairy and over 1000sacttered small scale informal milk traders and hawkers who sell milk to the urban and peri-urban areas.

Challenges Facing the Sub Sector

Production challenges include the low average milk production of 1000lts per annum compared to world best practice of 8000 and high cost of production. The Poor/low Livestock genetic potential due to low uptake of AI- of 20% is also a major challenge. This is as result of high cost of AI Services, lack of knowledge, inconsistent service, few AI providers and unethical practices among AI providers. Other key challenges include poor access to quality feeds due to high cost, unavailability of fodder during dry periods, low quality fodder, access to quality veterinary services, inadequate extension services and high cost of credit.

Challenges in milk processing. The cost of processing constitutes 55% of the total cost in the chain due to high cost of packaging materials. Furthermore only 30% of installed capacity of 3million litres daily is utilised presently. Additionally only 18% of the milk is processed compared to 98% in South Africa and there is limited product range dominated by fresh milk. Only 3 % of the milk is value added into cheese, butter and ghee meaning a huge opportunity for accelerated value addition exists.

Transport and marketing challenges include poor roads, low access to cooling facilities in milk surplus areas and lack of appropriate milk transport equipment. There is also the huge challenge of unmarketable milk quantities due to low production and many farmers who are not organised into efficient marketing systems. Some of the cooperatives existing in the area also experiencing organizational and management challenges coupled with negative perception by the farming community. Marketing is also hampered by a weak domestic market due to a low per capita consumption of 80-100litres per annum, little surplus for external markets and supply fluctuations based on weather and forage availability. Informal market channels which account for approximately 60-80 percent of marketed milk pose significant quality control challenges. Kenya is a weak player in the export markets mainly exporting (UHT) and fermented milk.

Technical support to the dairy sector

The current technical support extended to the dairy sector is through the a number of projects such as the National Agricultural and Livestock Extension Project (NALEP), the Kenya Dairy Development Programme funded by USAID and the East African Dairy Development project(EADDP). The main focus of support is on training and extension services to improve productivity, capacity building to support cooperative societies and dairy enterprises market development and promoting local consumption. The EADDP in particular is supporting the establishment of cooling facilities for cooperatives but the project coverage is only 2 out of 37 districts in the region hence the need to supplement and diversify the project activities though other interventions. There is need to intensify technical assistance in the area of organizational development especially for the farmer groups, technological support to these groups as well as market development, quality assurance and marketing strategy.

Investment opportunities

Demand for milk and dairy products in COMESA and EAC countries is predicted to grow at 3.5 % annually upto 2020 hence the need for interventions to support growth and exploit the opportunity. Opportunities at production level include improving overall management of the smallholder's farms through well directed extension approaches. There is need to improve the dairy breeds genetic and production potential as desired and already initiated by farmers groups, raise milk production per cow, attain marketable milk volumes and enable farmers to earn premium prices. This presents an opportunity to invest in these groups and support them to achieve their breeding vision. Strengthening these groups will also make them efficient centres for overall improvement of milk marketing, training and provision of comprehensive support services in partnerships with private service providers.

Support to this part of the chain would also entail popularizing high value forage crops, enhancing fodder preservation for the dry seasons, investments in storage facilities for natural fodder and promotion of home feed rationing to reduce feed costs. Other measures include establishment of cottage feed mixers by farmers and youth entrepreneurs and establishment of small feed mills by cooperatives and farmer groups. Establishing and managing dairy farms and providing farm enterprise management services represent a viable option while local production of vitamins, amino acids, macro and micronutrients for the feed mills can also be undertaken by large scale investors.

At processing level investment opportunities exist in expanded production of value added products such as cheese and powdered milk. Purchase of refrigerated vehicles, establishing cooling and bulking facilities, sale of equipment and provision of technical support can be done in the cooling and transport part of the chain. In processing the most urgent investment required is the capacity to process UHT and powder milk rather than the expansion of fresh milk processing.

At the national level, investments to stabilise the industry include promotion of local milk consumption, establishment of school milk programmes, inclusion of dairy products in the stocks of national food strategic reserves, improvement of roads network and infrastructure as well as development and implementation of quality control mechanisms for the industry. Strengthening of research, extension and private sector partnerships will enhance the smallholder dairy subsector

Figure 1:Kilimo Trust officials on a tour of the Central Kenya region where the study was carried out . Last two photos shows some of the farmers who participated in value chain meetings

CHAPTER 1 - INTRODUCTION AND BACKGROUND

1.1 Dairy Industry in Kenya

In Kenya, livestock farming is an important economic activity due to its role in raising household incomes, improving food security, providing manure for crop production and providing marketable products like milk, calves, meat and cullings(MOA 2009, Technoserve 2008, Karanja, A.M. 2003). With annual milk production in Kenya estimated at 4.2 billion litres in year 2009, the Dairy sub sector in particular provides a means of livelihood to about 2 million Kenyan households and creates forward and backward linkages with the rest of the economy.

Fig 2: A Map of Kenya showing the central Kenya Region

1.2 Smallholder Dairy Sub-sector in Central Kenya Region

Central Kenya region comprising of over 37 administrative regions is classified as a milk surplus area compared to the other eight provinces in the country. It is estimated that there are over 600,000 smallholder dairy farmers in the region and the sector is a source of livelihood for 1.2 million households and this mirrors the trend in COMESA and EAC countries where 80 percent

of produced milk comes from small-scale farm holdings. Current estimates indicate that the value of dairy produce in the region is close to 30billion and this can easily be doubled if stability in the industry is maintained (GOK, 2010).

1.3 Some Constraint in the Smallholder Dairy Sector in the Region

Despite the significant contribution of the dairy sector to the economy of the central Kenya region, the industry is still besieged by a number of technical, economic, and institutional problems which lead to lowered incomes for small-scale farmers and poor livelihoods. Some of the challenges limiting the exploitation of the smallholder dairy sector potential include but are not limited to the following;

1. Low earnings from milk sales making the sector uncompetitive. Smallholder farmers are unable to attract premium prices for their milk due to low unmarketable milk volumes.
2. Low milk productivity at farm level.
   Productivity per animal in the smallholder dairy sub sector has for example remained low at about 1300 litres per annum compared to the world best practice of about 4000-6000 litres (Karanja A. M., 2003; GOK, 2007). This is due to many challenges such as poor breeds, low use of breeding improvement techniques like AI, poor husbandry practices, disease epidemics and lack of business orientation among dairy farmers
3. The governance and leadership challenges in the co-operatives sector which dominates the cooling and bulking segments of the industry value chain. This has a negative impact on farmer incentives to produce milk.
4. Low market share of processed milk products due to limited processing activities.

1.4 Need for a Strategic Smallholder Dairy Sector Value Chain Study

The central Kenya region has immense potential for a thrifty and profitable smallholder dairy industry. To realize this potential, however, the industry needs to address several challenges, including the ones stated above.

The question is which organizations within the public or private sector are best suited to address these problems. Secondly, what are the mechanisms through which these problems can be addressed and thirdly, what are the specific and general roles of smallholder farmers?

Jomo Kenyatta University of Agriculture and Technology (JKUAT) through support from the Kilimo Trust therefore identified the need to carry out a strategic study of the smallholder dairy industry in central Kenya to address the above issues.

1.5 Terms of Reference for the Strategic Study:

The specific terms of reference for the strategic study were:

a. Review the present smallholder dairy farming structure and profile in central Kenya and relate it to the national and large scale sub sector
b. Identify constraints facing the sub sector and delineate commercialization opportunities along the value chain. The study should make specific recommendations relating to the constraints and possible entry points to address these constraints.
c. Identify key players along the value chain
d. Asses the impact of public sector intervention in the value chain together with policy interventions for deepening market led regulations
e. Recommend possible technical assistance to the key players both public and private that will make the industry more competitive and efficient
f. Identify and make recommendations on potential investments in the sector

1.6 Approach and Methodology

In carrying out the dairy sector value chain study, a participatory approach and methodology was adopted involving the following activities and stages:

Desk Study

This involved a review of all the literature and documents in the dairy sector. The sector has been the subject of numerous studies, some of which could be outdated. A wealth of information and experience exists within the various key players such as the Ministry of Livestock and Fisheries Development and the Kenya Dairy Board, work undertaken by the International Fund for Agricultural Development (IFAD), DFID, Land "O" Lakes, and ILRI among others.

Market Study

This part entailed discussions with key market players such as processors, wholesalers, retailers and other actors in the formal and informal marketing channels. Information on past, present and forecasted production levels and overall Kenya's export of dairy products was reviewed.

Field Study

Information and data from desk review was triangulated with interviews and discussions with key stakeholders. These included: Kenya Dairy Board, Ministry of Livestock and Fisheries Development, dairy processors, co-operatives, large and smallholder farmers and input suppliers.

Focus group discussion

Once a sufficient documentation of issues was carried out, two focus group discussions with the dairy industry's expert's, ministry of livestock officers, regulatory authority's farmers representatives and research actors were held so as to interrogate the issues in the report and put them into better perspective

Stakeholders Workshop

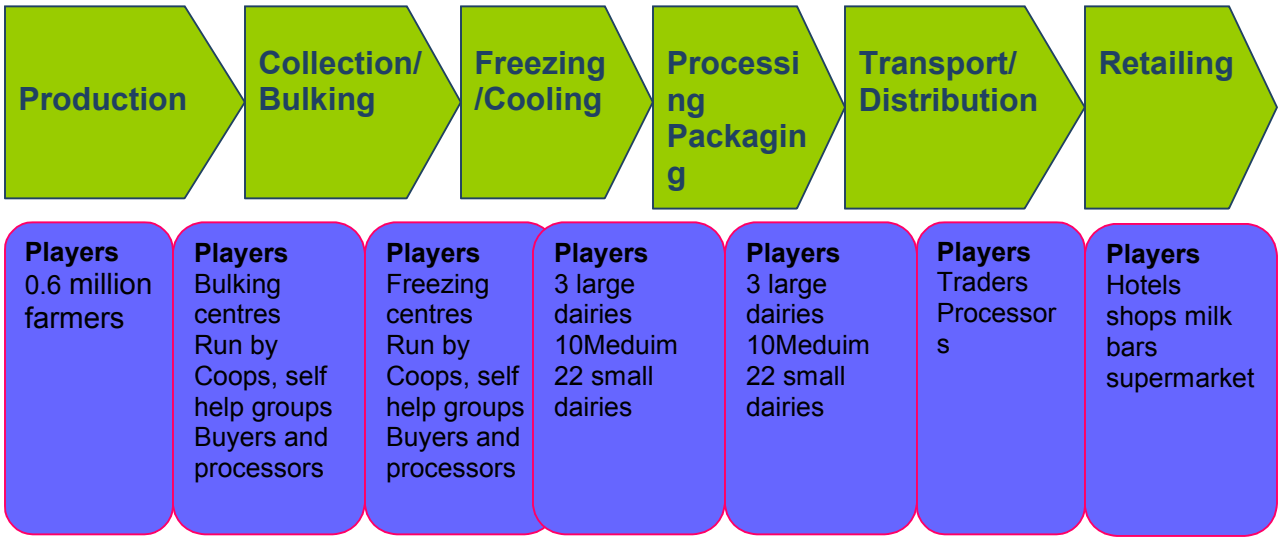
The findings and recommendations arising from the desk study and field phase stages of the dairy value chain study were then presented to industry stakeholders so as to allow them to make their final input and ratify the document. This was a way to ensure ownership and true representation of the situation.

CHAPTER 2.0 DETAILED FINDINGS FROM THE STUDY

2.1 Mapping of the Smallholder Dairy Sector Value Chain

The smallholder dairy value chain as mapped with key stakeholders comprises of a production phase, collection and bulking, cooling/freeing/chilling, processing and packaging, transport and distribution and retailing as represented in figure 3 below.

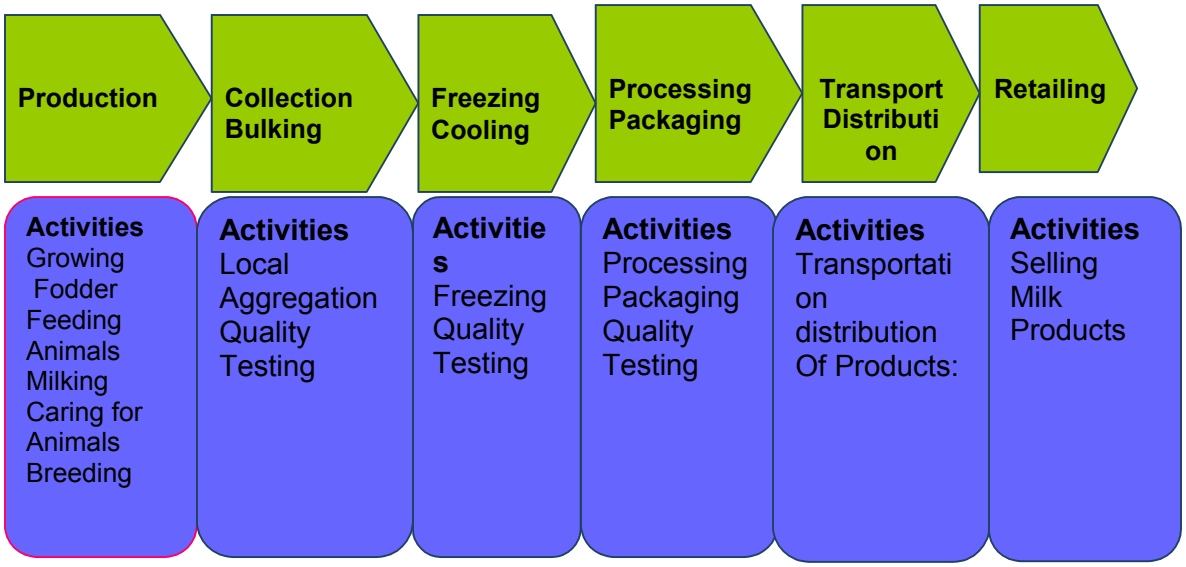
Figure 2: Industry Value Chain Structure



Source: Map generated during this study and Techno serve: 2005

The key activities along the value chain are illustrated in figure four below. These activities include growing fodder, feeding animals, milking, delivering the milk, local aggregation, freezing, processing and retailing

Figure 3: Key activities along the dairy sector value chain



2.2 Milk Production Structure

The smallholder value chain employs over 600,000 Small holder dairy farmers keeping 1– 3 cows on an average of 1-4 acres of land. (**Source: data from this study- Ministry of Livestock Development Annual Reports).** In the year 2010 the estimated dairy cattle population in the central Kenya region was 852,900 which was second highest in the country behind rift valley with 1,895,100 animals. The production per animal among smallholders is estimated to be 1,400 litres per annum which translates to 4 litres per animal per day. However some studies indicate that close to 18% of the farmers in the region produce even less than 2litres of milk per cow (Njonge et al 2007). Although this compares well with India, at 1,000 kg / year per animal it is fairly low since the average figures for the large scale industry in Kenya are over 8litres per cow per day. The production figures for cows in developed dairy sectors of Denmark and Australia are over 8,000litres per cow per annum. Kenya therefore has a long way to go to achieve the productivity levels in developed countries. Of concern is the low productivity level in Kenya relative to South Africa considered a direct competitor in the regional market?

There are three types of dairy production systems that are practiced in the region, zero-grazing (intensive), semi-grazing (semi-intensive) and open range (extensive). 0f particular interest is the extent of peri-urban dairy farming in the region based on very intensive zero grazing systems with high production comparable to the large-scale farms

Figure 4: Typical Semi Zero Grazing Units in the Area

The distribution of cattle in the province is varied with Nyandarua district having the largest population as indicated in table 1 below

Table1: **Estimated No of Dairy Cattle in Various districts Central Kenya**

District	Kiambu East	Kiambu West	Nyand North	Nyand South	Nyeri South	Nyeri North	Kirinyaga	Mur N	Mur S	Thka	Gtd
No	73414	75695	151586	108384	79812	85050	64816	76284	75321	48748	48800
Total	887909 dairy cows- Source-MOLD 2010										

Milk Supply Fluctuation (Flush Season Syndrome)

One of the main challenges in the production phase of the value chain especially among the smallholders is the seasonal fluctuation of milk supply due to changes in weather, poor feed conservation and poor planning by farmers. This affects the available volumes and disrupts the operations of cooling and processing centres thus reducing efficiency and creating cycles of milk gluts followed by shortages. This disrupts milk supply and availability which subsequently leads to price fluctuations and unpredictability at farm gate. The reasons for this fluctuation include rainfall pattern, availability of natural pasture and feeds, the natural cycle in milk yield during the cow's lactation period and the calving period as influence and determined by the dairy farmer.

2.3 Dairy Cattle Feeding and Management

Dairy cattle feeding is a major cost component accounting for 70-80% of total cost of production. This makes feeding a major determinant of productivity and profitability. The levels of supplementation with concentrate feed and total cost of feeding are largely associated with the type of grazing systems adopted. Over 80% of the farmers in the region practice semi intensive to extensive form of grazing. The cows may be left to graze in the small pasture fields but later fed in confined sheds in the evening due to shortage of grazing land. The most common fodder grown is Napier grass, fodder maize stalks with about 5% currently growing assorted legume fodders such as sorghum, oats, calliandra and leaucaena. Table 2 below shows the estimated acreage of fodder in the area

Table 2: Pasture and Fodder Situation on central Kenya

District	**Natural pasture Ha**	**Improved pasture Ha**	**Napier Ha**	**Assorted legumes Ha**	**Fodder trees Ha**	**Sweet potato ha**
Nyandarua N	59750	26650	122	28	94443	477
Nyandarua S.	14100	3691	645	253	8015	1031
Nyeri N	31725	3319	3227	112	1504	29
Nyeri S	33326	3767	6167	158	120382	90
Kirinyaga	956	20	2906	364	21507	44

Muranga S.	1029	0	4231	16	36	463
Muranga N	940	6000	6100	10	20	550
Thika	43293	2164	1300	7270	216	108
Gatundu	1000	267	6000	10	3000	1000
Kiambu East	2840	125	5889	9	6700	114
Kiambu west	5205	452	9099	4	3040	167

Source: GOK 2010

This shows that in some districts the farmers practice more intensive semi zero grazing but also have a tendency to rely on nappier grass as the main source of fodder. This over reliance on nappier grass presents an investment opportunity where areas with large farm sizes like Nyandarua could be encouraged to produce improved hay for sale which is in great demand in the region. The cost of a bale of improved pasture grass hay costs between 200-300kshs.

Supplementation with dairy meal and other commercial feeds is practiced by over 65% of the farmers in the region. Although investment in commercial feed manufacturing is elaborate, access to the feeds, quality and high cost are major challenges. Indeed 90% of the farmers interviewed raised this as a major concern and assessment done to feeds found out that at times fishmeal a major raw material in feed manufacture is adulterated and may contain upto 60% sand. This presents an opportunity where farmers can be trained to make home made rations and youthful entrepreneurs supported to start cottage feed manufacturing and farmers societies encouraged to venture into feed manufacturing to ensure quality of feeds, create jobs and possibly lower the cost of feeds.

Feed and Fodder Conservation

Most farmers in the region rely on natural pastures but due to shortage of pasture land and knowledge acquired through intensified trainings being carried out by the various agencies, fodder conservation is slowly gaining a foothold. The study indicated that over 30% of the farmers interviewed carry out one form of conservation. Tube silage and hay making are the most popular forms of conservation as shown in table three and figure six below

Table 3: Amount of Forage Conserved as Hay/Silage in selected districts

District	Tube silage	Ground silage	Hay	Standing hay
Nyandarua North	1,430	-	374	12
Nyandarua South.	30	120	80	320
Nyeri North	108	-	327	700
Nyeri South	139	5	18	150
Kirinyaga	2,022	62	793	1029

Muranga South	337	-	-	2
Muranga North	163	3	15	12-
Thika	2,500	3200	112	-
Gatundu	60	29	-	-
Kiambu East	10	165	-	-
Kiambu west	12	5	1000	-

Figure 5: Feed through Tube Silage and Dry Forage

2.4 Production costs

Data indicates that scale of production has an important bearing on the profitability of dairy farming. A study in one of the districts in the region estimated that intensive scale rural farming with over 6 cows is the most profitable.

Table 4: Cost of Milk Production and Related Revenue (Muranga, Nyeri and Nyandarua)

Kshs	**Muranga**	**Nyeri)**	**Nyandarua**
Cost of production per litre	21.2	19.3	16.9
Sale price per litre	25.5	23.2	20.3
Profit (Kshs per litre)	4.3	3.9	3.1
Percentage profit)	20.4%	20.6%	18.3%

The overall value chain costing has been done in numerous past studies (Technoserve, 2005, SDP 2006, IFC 2008). As at 2009 the farm level part of the chain only accounted for 25% of the revenue while the processing and packaging part of the value chain accounted for 55 percent of revenue, equivalent to Kshs 28 /=. However the government has tried to induce a minimum farm gate price to alter the situation but market forces appear more effective in price stabilisation

Table 5: Overall Value Chain Cost

	Farm level production	Transport	Bulking and cooling	Transport	Processing and packaging	Distribution	Retailing	Total
Share of Revenue (%)	26%	3%	3%	2%	55%	3%	8%	**100%**
Kshs/ litre	**18-21**	**2 -4**	**1-3**	**1-3**	**28**	**1**	**4**	**50**

2.5 Dairy Cattle Breeding and Use of Artificial Insemination

Historical Background

Artificial Insemination has been used in Central province since early 1960 by African farmers to improve production and control venereal diseases. Between 1966 and 1991 the government through the Department of Veterinary services provided A.I services at highly subsidized cost.

However in 1991 due to the structural adjustment programmes carried out, A.I services were privatized. This represented a shift in policy that entailed encouraging private veterinarians, A.I technicians, dairy cooperative societies and community self help groups to start their own A.I enterprises and lender the service on commercial basis. This made the service costly and inaccessible to the majority of the smallholder dairy farmers making 70% of them to result to the use of bulls of unknown genetic merit. However, with revival of New Kenya Cooperative Creameries (KCC) in 2003 and improved prices of milk, many farmers have resorted back to using AI and the uptake of is on the rise though it is estimated to 35% presently.

The key players in the breeding industry therefore include the Central Artificial Insemination Service (CAIS) through its agents, the registered AI services providers, the department of veterinary services and progressive farmers. Other players are the **Kenya Livestock Breeders Organization i**nvolved in registration of livestock breeds and the **Livestock Recording Centre** which is involved in the implementation of the Progeny Testing Programme which ranks A.I bulls in order of genetic merit. Table six below shows the amount of semen distributed, the number of inseminations carried out and litres of liquid nitrogen distributed in year 2010 in central Kenya

Table 6: A.I Service Providers and Total Inseminations in Central Province 2010.

District	CAIS Agents	semen dozes distributed	licensed AI providers (2010)	No of insemination per month	liters LN2 distributed
Nyeri	Country Veterinary S	2800	52	2654	600
	Karatina Veterinary S.	2600	38	2421	550
Kirinyaga	Wakulima Agrovet S.	2200	30	1875	530
Murang'a	Elika agrovet	2500	56	2373	750
Maragua	Kandara Veterinary C	1238	16	967	320
Thika	Thika farmers Centre	3650	48	3572	950
Kiambu	Smuka Veterinary centre	4000	46	4467	1200
	Kiambu Kulima agrovet (	3500	42	3459	950
Nyandarua	Country Focus Veterinary	4500	55	4325	850
	Dr Mathenge clinic	1250	26	984	550
Total		**28238**	**409**	**27,097**	**7250**

Out of the 409 licensed AI service providers in Central province 80% are self employed with the rest being employed by dairy cooperative societies, self help groups and private farms. Apart from the CAIS Agents in the province, there are 5 semen distribution agents in the region who sell an average of 1200 doses of imported semen doses per month. The CAIS agents also distribute an average of 2000 doses of imported semen per month. Although the study estimated that only 1/3 of the farmers in the province are on AI, the demand for the service is high because out of the 550,000 inseminatable cows in the province, only 50% of them were inseminated in year 2010.

The challenges faced by farmers in trying to access AI services in the region include high cost, lack of variety in the semen distributed by CAIS and hence limiting the choices available to the farmer. Other challenges include lack of knowledge by farmers on heat detection, AI record keeping and timing for an insemination. There are widespread cases of repeat inseminations, occasioned by unethical practices, poorly trained personnel as well as poor accessibility especially during the wet season which further aggravates the cost of AI services

Table 7: Indicative Costs for Various Types of Semen

SEMEN SOURCE	**CATEGORY OF SIRE**	**COST PER DOSE**	**COST PER INSEMINATION**	
			SELF EMPLOYED	COOPERATIVES & SELF HELP GROUPS
CAIS AGENTS	Young Sires	180.00	700.00	500.00
	Nominated Sires	250.00	800.00	600.00
	Progeny tested Sires	350.00	1000.00	700.00

Imported semen	Low priced sire	400.00	1200.00	800.00
	Economy sire	600.00	1500.00	1100.00
	Renowned Sire	2000.00	3000.00	1500.00
	Gender Selected	5000.00	6000.00	6000.00

On the other hand the challenges faced by AI service providers include inadequate supply of semen for the popular Friesian breed, lack of liquid Nitrogen(LN2) and high cost of establishing an AI unit. The present indicative costs for these assets are as follows; LN2 container costs KShs45, 000 per 3 litre, motorbike for transport costs 90,000 and the AI kit is approximately Kshs 25,000.

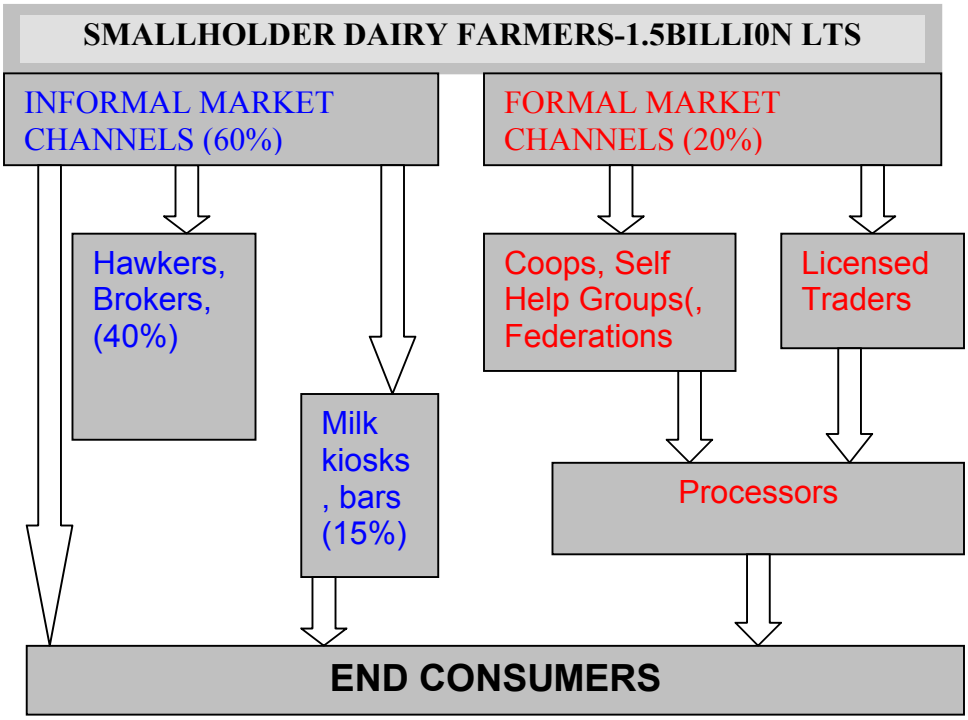
2.6. Dairy Industry Marketing Channels

Studies give varying data on the amount of milk marketed in the region and the existing marketing channels. In this study channels identified include direct sales to consumers and milk bars, informal milk vendors, sales to cooperative societies, sales to smallholder dairy self help groups (SDSHG), farmer federations and sales to the processing factories in the region. The study identified the main milk marketing channels as illustrated in the figure 7 below. In this version, 20- 40percent of marketed milk is processed while 60-80percent is marketed through informal market channels and directly to consumers.

The informal milk marketing channel grew rapidly after the liberalization of Kenya's milk sector in 1992, which led to the near collapse of the state-owned Kenya Co-operative Creameries. Consequently, large numbers of small-scale milk vendors grew quickly to fill the gap but lots of concerns regarding the quality of their milk has been raised. This informal market is the greatest obstacle to the rapid growth of dairy processors. With their nominal overheads and lack of regulatory and sanitary oversight, informal market players are able to compete effectively on price basis, hence the large market for raw milk, particularly in urban areas. Campaigns to educate consumers on the health benefits of consuming pasteurized milk have not had much impact on consumers.

Given the popularity of milk packaged in poly pouches, which is up to twenty percent cheaper than the tetrapak paper packaged milk, it is reasonable to assume that most consumers would prefer pasteurized milk, if it were priced within their reach. However the national regulator and the industry are presently engaged in a process to train and formally register the milk hawkers instead of banning their activities

Figure 6: Main Marketing Structure for Smallholder Dairy Farmers in the Region



Nb. The total amount of milk marketed is about 70% of gross production and the balance is fed to calves or consumed at home

2.7 Milk Transport and Bulking

Many milk bulking, collection or buying centres owned by dairy cooperatives, dairy self help groups, middlemen, small milk processors, individual bulk buyers and agents of large milk processors are widely distributed in the region. Transport from farm to these collection centres (bulking) is through informal transport systems such walking, bicycles, carts and donkeys.

Transport of milk from these bulking centres to the cooling facilities costs from Kshs 2/= to Kshs 3/= per litre but this may increase due to conditions of the road and distance which often varies

between 1-30km in some remote parts of the region. Associated with transport costs and poor road conditions in the milk density areas is the waste that arises from delayed access to chilling centres, processing factories and markets. The study estimated that 40 percent of milk is wasted due to lack of access to cooling facilities. On the other hand milk transportation from cooling centres to processing plants is a formal process using refrigerated trucks and is part of the processing value chain costs. Similarly, distribution costs from processors to retail outlets are part of the costs at the processing stage of the value chain.

2.8 Milk Prices

The milk prices in the region have experienced great volatility with the current farm gate prices varying between 19kshs and 32kshs respectively. Of particular interest is the milk volume bonus which is paid to farmers once they deliver over 5000litres of milk to the large processors like the Kenya cooperative Creameries (KCC). The study realized that some farmers are able to earn over 4 Kshs bonus when they deliver more than 5000litres of milk. This has encouraged farmers to aggregate milk through formation of federations amalgamated from the small Dairy Self Help Groups. One such successful group is KIKAMA federation in Muranga district formed in 2009 with only 600 farmers but has now grown to a membership of 3,200, representing 45 groups in less than one year and is now delivering over 500,000 litres of milk worth over 13million Kshs on behalf of its members. The table below shows a summary of the milk deliveries by this one federation between July and October 2009

Table 8: Daily and monthly milk deliveries by KIKAMA to KCC in 2009

Month	Quantity of milk delivered daily	Monthly delivery	Monthly earnings
July	9,100	282,653	7,772969
August	12,729	394,626	10,852.240
September	31912	417,382	11,478,024
October	15,756	488422	13,431,619

The federation is able to negotiate a bonus price of 4kshs above the rest and pays farmers at 27.50 per litre of milk besides providing all-inclusive services to dairy farmers such as feeds supply, artificial insemination services, training and extension, and negotiating for credit. However peri-urban farmers are able to command higher milk prices due to proximity to markets, high quality of their milk, stronger bargaining power, value addition possibilities and consistency in supply.

2.9 Domestic Market and Export Markets

Annual per capita milk consumption in Kenya is estimated to be 81-100 litres (FAO 2007, SDP Study 2007, this study). With the population of Kenya estimated to be 40 million, this would indicate annual consumption of 4 billion litres. The consumption pattern in urban areas varies from 125 – 150 litres, while the pattern in rural households could be as low as 20 litres per capita. This is consistent with indications from other studies which have put the consumption at 3.8 billion litres per annum. Ideally this means that there is no surplus milk for export markets.

Most processed milk is sold in Nairobi (56 percent) and the many urban centres in the area. The preference for processed milk is based on: perceived quality, and fewer health risks, convenient packaging, and a longer shelf life. On the other hand, raw milk is preferred for various reasons, including: lower prices (20 – 50 percent cheaper than processed milk), higher milk butterfat content, fresh taste and convenient, variable sale quantities. Consumers feel that the health risks associated with raw milk are eliminated through boiling of raw milk before consumption

The introduction of cheaper packaging brand of milk in the market using poly pouch has dramatically increased the demand for processed milk. With the entry of new processors in the market through this brand (Githunguri, Lari), it would appear this market segment will experience remarkable growth. Studies have also indicated that the growth in demand for processed milk will increase by 12percent and the demand for other processed products will be about 9.5 percent in the next 10years

Export markets

Kenya is a weak player in the milk export markets. In total, 6tonnes of milk and milk products, mainly long life milk (UHT) and fermented milk, amounting to Kshs 350 million kshs were exported to regional markets (Tanzania, Uganda, Seychelles and DR Congo, among others) in year 2009. According to "Regional Dairy Trade Policy Paper", the demand for milk and dairy products in COMESA and EAC countries will grow by 3.2 percent and 3.5 percent annually between 1993 and 2020 to reach 40.0 million tones. The COMESA and EAC regions are primarily milk deficit countries with Tanzania and Uganda having the largest milk products deficit. This presents attractive marketing opportunities for Kenya's dairy industry, especially in the regional exports of UHT milk. Kenya has actually not exploited the regional market, especially with regard to UHT milk as illustrated in the table below.

Table 9: UHT Milk Imports by EAC Countries and Kenya's Market Share (2005)

No.	Country	Import of UHT Milk	Kenya's Share of the Market (M / Tons)	Percentage Kenya Share
1.	Tanzania	6,946	2,223	32%
2.	Uganda	24,465	17,566	72%
3.	Rwanda	290	0	0%
Total		31,701	19,789	62%

Source: KDB 2008

It would appear that Kenya has potential to expand her regional market in UHT milk. However, constraints that must be overcome to achieve this include high cost of UHT milk, quality concerns related to weak quality assurance system along the value chain, and administrative barriers to intra-regional trade.

2.10 Milk Processing

Since milk market liberalization in 1992, competition in milk processing and marketing has increased significantly. There are over 36 licensed private and dairy cooperative processors in the country. The Kenyan dairy industry is dominated by three major dairy processors: New KCC, Brooke side and Spin Knit. These three dairy processors have countrywide coverage in terms of milk collection, sales and distribution. These three processors also have the capacity to produce a wide range of dairy products, but New KCC is the only processor with milk powdering capabilities. The rest of the dairy industry is made up of medium or small-scale processors, with limited product range and milk collection and distribution networks. Notable farmer cooperative processors who only handle their members' milk include **Githunguri Dairy, Limuru Dairy, Mukurueini and Lari Dairies.**

These farmer cooperative processors have demonstrated the potential of enhancing the competitiveness of the smallholder dairy sub sector since they are able to assure farmers of a ready market for the produce. Furthermore the cooperatives also operate on the basis of the Hairy Hub Model where they offer embedded services such a supply of better feeds, provision of AI and veterinary services, investment capital, training and capacity building, and overall business development services to their members. Other small processors include some private dairies, and many backyard mini-processing units. The table below shows the leading milk processors, their processing capacity and product range in the study area.

Table 10: Leading Milk Processors in Central Kenya the Region

Processors Name	Milk product brand name	Installed Capacity LTS	Product range						
			Fresh Milk	Powder	Cream	Yoghurt	UHT	Butter	Cheese
New KCC	New KCC Safari land	1,200,000	x	x	x	x	x	x	x
Brookside Dairy	Brookside/Ilara	700,000	x		x	x	x	x	x
Spin knit	Tuzo	300,000	x		x	x	x	x	
Githunguri Dairy	Fresha	120,000	x		x	x		x	
Limuru Dairy	Limuru	50,000	x		x	x		x	
Palmhouse Dairy	Palmhouse	5,000	x		x	x		x	
Lari Dairies	Sundale	-	x		x	x		x	
Affrodane	Affrodane	40,000	x		x	x		x	
Aberdare creamery	Aberdare	100,000							

CHAPTER 3. INSTITUTIONAL SETUP, POLICY FRAMEWORK AND TECHNICAL SUPPORT FOR THE DAIRY SUB-SECTOR

3.0 Preamble

The institutional framework for the dairy sector comprises of dairy farmer co-operatives, dairy farmer self help groups (DFSHGs) farmer organizations/groups; processors, the Ministry of Livestock development, and its constituent departments, the Kenya Dairy Board;, research institutions (KARI, ILRI, KETRI, Universities), development partners and service providers.

3.1 Dairy Farmer Co-operatives, Self Help Groups and Federations

There are over 80 primary co-operatives in the region whose roles vary but they all offer milk collection cooling and bulking services, inputs supply to members, service delivery (AI, drugs), credit access, and extension services. Some co-operatives have entered into processing and marketing (Githunguri, Limuru, Mukurweini and Lari) and established very successful marketing mechanisms and brands based on the processing hub model. This has made them the envy of other farmer groups who now seem to believe that this is the way to go for all of them to make dairy farming profitable. However industry experts have questioned whether the co-operatives should build competence at the production and cooling/bulking level: or whether they should operate at all levels of the Dairy Value Chain? The skills base and governance structure of the co-operatives would indicate the need to consolidate effort at the lower end of the Value Chain (support services, extension services, cooling and bulking, and provision of financial services to farmers **(IFC, 2008).**

An interesting latest development in this area is the emergence of over two hundred (200) dairy farmer self help groups that have become key players in the marketing value chain. These groups also pool farmer's milk to aggregate the volume, transport the milk to the buyer and also offer other services such as training, input supply and linking farmers to other service providers. Others have organized themselves to undertake the development of breeding of their livestock so as to supply the huge demand for breeding stock in the region and Kenya in general. The DFSHGs most important achievement is the aggregation of small quantities of milk through formation of federations so as to earn bonus prices paid for huge volume milk deliveries to the processors. However they are facing numerous organizational challenges but given the enthusiasm they have generated among dairy farmers and the farmer's negative experience with

cooperative societies, they represent a powerful new entry point for supporting smallholder dairy farmers. Table 11 shows the distribution of cooperatives and dairy self help groups in the region.

Table 11: **Distribution of Cooperatives and Dairy Self Help Groups 2010**

District	No. Of Dairy Cooperatives	No. Dairy Self Help Group	Total
1. GATANGA	1	1	2
2. GATUNDU NORTH	0	0	0
3. GATUNDU SOUTH	0	0	0
4. GITHUNGURI	3	0	3
5. KABETE	4	1	5
6. KANDARA	1	5	6
7. KIAMBAA	2	0	2
8. KIAMBU WEST	1	0	1
9. KIENI EAST	6	7	13
10. KIENI WEST	6	2	8
11. KIGUMO	6	14	20
12. KINANGOP	3	15	18
13. KIPIPIRI	4	6	10
14. KIRINYAGA CENTRAL	1	2	3
15. KIRINYAGA EAST	1	12	13
16. KIRINYAGA SOUTH	0	2	2
17. KIRINYAGA WEST	0	5	5
18. LARI	4	3	7
19. MATHIOYA	0	8	8
20. MATHIRA EAST	0	18	18
21. MATHIRA WEST	0	15	15
22. MILANGINE	0	2	2
23. MUKURWE-INI	1	2	3
24. MURANGA EAST	2	24	26
25. MURANGA SOUTH	0	4	4
26. MURANGA WEST	1	13	14
27. NYANDARUA CENTRAL	0	5	5
28. NYANDARUA NORTH	4		4
29. NYANDARUA SOUTH	4	10	14
30. NYANDARUA WEST	3	8	11
31. NYERI CENTRAL	1	2	3
32. NYERI SOUTH	1	2	3
33. RUIRU	0	0	0
34. TETU	0	0	0
35. THIKA EAST	0	0	0
36. THIKA WEST	0	1	1

37. PROVINCIAL TOTAL	**60**	**189**	**249**

3.2 Milk Buyers and Processors

These are a key group in the dairy value chain since they determine the market price of milk at the farm gate. The main buyers identified in the study include individual buyers, hotels and milk bars, milk hawkers, small milk traders who purchase 1000-5000litres and large scale registered milk traders who purchase over 10, processors 000litres. The main as indicated in the earlier parts of this report include KCC, Brookside and Spin-Knit. A few farmers' co-operatives (Lari Limuru and Githunguri) are now active players in the formal processing sector. Of these three, New KCC is the leading buyer of milk and its presence in the region plays a major milk price stabilisation role. In addition there are key service providers such as input suppliers, agrovet shops, AI service provider's, milk transporters and equipment suppliers

3.3 Ministry of Livestock Development

The core functions include: formulation of policy, coordinating policy implementation, regulation of inputs, produce and marketed products, management and control of diseases and pests, research agenda setting, liaison and co-ordination; facilitating the provision of extension services and information management and dissemination. In line with the liberal economic environment, traditional functions performed by the Ministry, including extension services, artificial insemination, production of vaccines and training services, have now been taken over by private sector players, including Non-Governmental Organizations (NGOs). The transition from public service delivery to private and community based service delivery has presented challenges which can be overcome through a clearly focused intervention programme targeting all aspects of along the value chain. Records indicate that the ministry of livestock has less than 200 technical extension personnel in the whole region and this coupled with administrative and logistical support issues makes training and support to dairy farmers a Herculean task

3.4 Kenya Dairy Board

Kenya Dairy Board is the industry regulator in Kenya and has the overall mandate for the development and regulation of the dairy sector. In the current liberalized environment, the legal mandate of KDB is outdated. However the role of the board has come under scrutiny because International best practice indicates a move towards stakeholder managed industry associations with responsibility for productivity, quality control, research and development; and sector

advocacy and promotion. This is also clearly the position advocated by the draft Dairy Policy 0f 2006. Transformation of the dairy board into an industry association would mean that membership would include all industry players (farmers, co-operatives, processors and marketers). The governance and leadership of the association would then be bestowed upon an elected Board accountable to members and day to day operations carried out by technical staff appointed by the board. To finance its operations a levy would then be charged on all milk handled along the value chain.

3.5 Industry Associations

Industry associations currently include Kenya Livestock Breeders Association; Kenya Dairy Producers Association; Kenya Livestock Producers Association; Kenya Dairy Processors Association; and East and Southern Africa Dairy Association (ESADA). Others include the Breeds Societies such as the jersey association of Kenya responsible for the development and promotion of respective livestock breeds and setting breed standards but most smallholders are not members of these associations.

3.6 Existing Technical Assistance Projects in the Dairy Sector

The existing efforts to technically support the sector mainly focuses on training and extension services to improve productivity at farm level capacity building to support cooperative societies and dairy enterprises to develop standardized management and financial tools and inculcate good corporate governance practices. There is need to intensify technical assistance in the area of market development, quality assurance and marketing strategy. Also needed is efforts and support to the creation of sector wide institution/associations to articulate broad industry issues and those that ensure effective representation and self-regulation. Some of the current technical assistance projects operating in the region and their focus are described below.

3.6.1 The National Agricultural and Livestock Extension Programme (NALEP-SIDA)

This programme is supported by SIDA and GOK and the implementation of activities done through the ministry of livestock development. The main thrust of this programme is the mobilization of farmers into common enterprise groups for purposes of training and is largely credited with the emergence of the Dairy Farmer Self- Help Groups that are changing the way milk is marketed in the region. This programme is the largest support to the dairy sector in the

region but the effectiveness of the project is limited by all the challenges facing the public service systems such as limited staff, bureaucracy and inertia.

3.6.2 Central Kenya Dry Area Project (CKDAP-IFAD)

This is supported by the international fund for agricultural development (IFAD) and covers the dry parts of five districts in the region (Thika, Nyandarua, Muranga South, Kirinyaga and Nyeri South). In livestock, the project focuses on upgrading of small stock such as dairy goats, strengthening of partnerships among service providers, promotion of drought tolerant fodder crops, and enhancement of value addition. This project is very timely but its limited in scope since it only focuses on arid areas which are not very active in dairy farming.

3.6.3 East African Dairy Development Project-EADB-Bill &Melinda Gates Foundation

The East Africa Dairy Development Project (EADD) is a regional diary industry development program implemented by Heifer International and a consortium of partners funded by the Bill & Melinda Gates Foundation. The vision of success for the EADD is that the lives of 179,000 families or approximately one million people are transformed by doubling household dairy income by the 10th year through integrated intervention in dairy production, market access and knowledge application.

EADD Kenya Country Project is working to enable farmers set up 13 new chilling plants and work with 4 old cooling plants during the 4-year pilot period. It is also expected through this project to reach 110,000 smallholder dairy families and 10,000 fodder farmers. The Kenyan component is being implemented in eight districts in Rift Valley and two districts (Nyandarua and Nyeri) in the Central Kenya region. The main focus of the project in Kenya is to facilitate the farmers and farmer associations in the following areas:

- Setting up milk chilling plants and supporting them to operate efficiently.
- Market research and development;
- Farmer and management committee trainings and organisational development
- Establishing and linking farmers to business development services and dairy service providers (AI, Vet, agrovets, dairy equipment suppliers)
- Facilitate linkages to high quality genetics and breeding program
- Facilitate cattle registration with Kenya stud book
- Develop best feed practices that are site specific and facilitate farmers to improve dairy production

The EADD is set to transform the operations of dairy industry but in the central Kenya region the project is only operational in two sites within two districts out of a total of 37 districts hence the need for other initiatives to support and complement this project

3.6.4 Kenya Dairy Development Programme (KDDP – (USAID)

USAID finances Land O'Lakes to implement the Kenya Dairy Development Programme, which works with development organizations such as ILRI, ABS, Worldwide Sires, other stakeholders in the dairy sub-sector and GOK institutions. The programme focus includes promoting domestic consumption of milk and dairy products; improving the quality and affordability of dairy products, establishing a market information system and technologies to increase milk production. The programme also focuses on strengthening dairy cooperatives and farmer organizations to access inputs, credit, services, and markets; breeding and AI services besides training in calf-rearing, training agro-vet store owners on business skills, improving feed conservation and feed supply, and training in milk handling and processing.

3.6.5 Kenya Agricultural Productivity Project (KAPP) – World Bank

The extension component KAPP pursues reform of agricultural extension into a decentralized, pluralistic, and demand driven system, and operationalise the principles of the National Extension Policy. The project operates in only two districts in the region and has also supported the formation CIGs for training enhancement which has led to the emergence of DFSHGs in Nyeri and Nyandarua. The project has also led to the entrenchment of private extension service providers ESPs in an attempt to promote demand driven extension services, the first phase ended but a similar form of the project called KAPAP has emerged with similar interventions.

3.6.6 Njaa Marufuku Kenya-(NMK)

This is a major extension initiative by the Government of Kenya which assists farmers groups with small financial grants of upto 120,000kshs for small agricultural investments. Some groups having written viable proposals have won this grant and started activities such as value addition, purchase of dairy equipment etc

3.6.7 Business Services Market Development Project (BSMDP) - DFID

BSMDP aims to address constraints impinging on the development of business services markets, by stimulating business transactions involving poorer households and helping private sector service providers overcome supply-side and demand-side problems, as well as information,

business incentives and capacity problems. It focuses on sub-sectors with potential for new business, growth, improved efficiency, value-addition, or employment creation such as the dairy sector.

3.7 Policy Framework for the Dairy Industry

In order to improve the performance of the dairy sector in Kenya, the government has proposed various policies in the past two decades. The last published dairy industry policy in Kenya was launched in 1993. Later on the Economic Recovery Strategy for Wealth and Employment Creation (2003-2007); the Strategy for Revitalizing Agriculture (2004-2014); the Strategic Plan of the Ministry of Livestock and Fisheries Development (2005); the National Dairy Development Policy (2006); National Animal breeding policy (2007) and the National Livestock Development Policy (2008) and Vision 2030 have been crafted which all recognised dairy farming as key thrust to economic development.

However the main policy thrust in the industry is provided by the **National Dairy Industry Development Policy (Draft, 2008).**The purpose of this policy is to develop and promote an efficient and self sustaining dairy industry in Kenya. The government has a vision to create a competitive dairy industry, both regionally and globally. The policy has identified various areas of intervention in order to facilitate dairy industry development in Kenya key among them being:

Breeding:

In order to address prevalent challenges in dairy breeding, the government intends to promote farmer, private and cooperative-based AI services while retaining the supervisory and regulatory roles. This will include increasing the number of trained inseminators, harmonization of the AI training curriculum, revamping of Central Artificial Insemination Station (CAIS), strengthening the linkage between breed societies, as well as the Kenya Stud Book (KSB).

Dairy feeds:

To address the challenges related to feeds, the policy highlights the need to intensify pasture growing, enhance fodder preservation for the dry seasons and promotion of home feed ration making. The Government will also encourage co-operatives and farmer groups to put up small feed mills or purchase feed mixers for making home made ration using locally available materials. The government will also strengthen the monitoring of feed quality at the point of sale through legislative changes and self-regulation in the feed industry through a strengthened

Association of Kenya Feed Manufacturers (AKEFEMA) and other stakeholders in the feed industry.

Extension and Advisory Services: As a deliberate initiative to introduce public-private sector investment in the extension and advisory services, the government will limit its activities in dairy extension to regulatory issues, including certification of the qualifications and messages being provided by the private, cooperative and processor-controlled extension systems. The government will then explore ways of supporting the new providers that are expected to include cooperatives, processors, universities and retired government extension workers venturing into private practice.

Dairy business environment: Areas of priority will include: - guiding the industry towards self-regulation path; development of contractual norms and corresponding legal mechanisms; establishing low cost dispute resolution mechanisms and industry codes of practice; facilitating the formation of a stakeholder driven ethical committee to handle arbitration issues in the industry; facilitation of the organization of interest groups along the value chain to improve performance in the sector; and support to the setting up of an industry umbrella association within the sector where stakeholders can dialogue and lobby. A tribunal to handle livestock disputes will be established to arbitrate issues on dairy industry, among others.

Milk collection: To address the challenge of milk collection, priority areas of emphasis will be on the revival of milk marketing cooperative societies, promoting the formation of dairy farmer groups, improving feeder roads and encouraging private sector facilitation in the endeavour.

Milk Cooling Processing and Grading: The policy recommends the speeding up of the rural electrification programme, especially in milk producing enclaves, while at the same time exploring the viability of alternative sources of energy, such as solar, wind, mini hydro plants and organic fuels for use in milk cooling. Further, measures to reduce electricity tariffs for reduced cost of milk cooling will also be explored for adoption by the relevant authorities. The government will also encourage investment in cold chain infrastructure by marketing cooperatives and private investors through the provision of incentives, such as tax exemptions on the necessary imported equipment.

Quality Control and Assurance: Emphasis will be to introduce measures to ensure that dairy processors and manufacturers put in place quality testing and assurance systems that conform to national and international standards. Such measures will include provision of incentives for milk

testing equipment procurement and installation, stakeholder sensitisation on the importance of safe use of antibiotics and other veterinary drugs at farm level, training on milk testing and operation of testing equipment, and strict enforcement of quality standards, both for raw milk and dairy products.

Informal Milk Marketing: The policy recommends the gradual transformation of informal milk trade into a formal and regulated one. This will include the establishment of a supportive milk dealer certification system, development and adoption of low cost packaging technologies ; training programmes on safe milk handling, improving the standards of milk processing in the informal sector; public education campaigns on the demerits of consuming unclean poorly handled milk, and facilitating compliance to standards by the informal milk traders.

Market Stabilization and Milk Strategic Reserves: Processors will be encouraged to offer premium prices during dry seasons. Other priority areas include promoting the processing of affordable long-life milk products and ensuring inclusion of dairy products in the stocks of national food strategic reserves. This has already been actualised through a presidential decree in 2010

Local Milk Consumption: Measures aimed at increasing per capita milk consumption among all income groups and in all areas will be upheld. Such measures will include promotion of wholesome milk consumption and encouraging production of a diversified range of milk and milk products that meets the wide array of consumer tastes and preferences.

Dairy Industry Information: In order to establish such a mechanism for the entire dairy industry, the government will implement the ICT and the e-government policy to the full. Strong linkages will be promoted between universities and other research institutions. In addition, the government will set up a national dairy information centre at KDB that will be equipped with a databank facility to collect, analyze and disseminate information on the dairy industry.

Vision 2030

Some measures identified under Vision 2030 to overcome the challenges in the dairy industry include increasing the availability of animal feeds through targeted programmes, such as seeding ranches and rangelands and enriched fodder, stemming the decline and re-energizing the use of artificial insemination services and purchasing breeding bulls and cows for targeted parts of the country, especially around the proposed Disease-Free Zones.

Figure 7: Most Popular Breeds in the Region

Fig 9. Summary of Key Players in the Dairy Sector in Central Kenya their Roles and Gaps

Key player or Progamme	Focus of intervention	Geographical region and coverage	Status	Remarks
National Agriculture and livestock Extension Project NALEP II-supported by SIDA and GOK	Offering extension Mobilization of farmers into CIGs	Based in the livestock ministry and covers all the districts	Ongoing	Coverage is limited by all the challenges facing the national extension systems such as limited staff, logistics
East African Dairy Development Project-EADB-Bill &Melinda Gates Foundation, Heifer Internl ,consortium of partners	Setting up milk chilling plants. Market research and development; Farmer organisational development Linkages to BDS, capacity building	Covering the east African region but only districts out of 37 in central Kenya	Ongoing	Promoting the chilling hub business model. Limited in coverage in the region
Central Kenya Dry Area Project (CKDAP-IFAD)	Upgrading of small stock such as dairy goats, strengthening of	Covers the dry parts of five districts in the	Ongoing	This project is very timely but its limited in scope

IFAD).	partnerships among service providers, promotion of drought tolerant fodder crops, and enhancement of value addition	region		since it only focuses on those areas that are arid in nature
Kenya Agricultural Productivity Project (KAPP) – World Bank	reform of agricultural extension services formation CIGs for training	The project operates in only two districts in the region	Ended being revived under KAPAP	Led to the entrenchment of private extension service providers. This needs replication
Njaa Marufuku Kenya-(NMK) initiative by the Government	small financial grants of upto 120,000kshs for small agricultural investments	Across the region but few (1-2) groups	Ongoing	Activities such as value addition, purchase of dairy equipment started but limited coverage
Business Services Market development Project (BSMDP) DFID	Commercialization of the service delivery, anchored on the Chilling Hub.	interventions supported the following selected clients:	Ended	Good lessons on commercialization
Kenya Dairy Development Programme (KDDP – (USAID) and Land O'Lakes	Promoting domestic consumption of milk establishing market information system; strengthening dairy farmer organizations, training and capacity building	Small areas of central and rift valley	ended	Good lessons on BDS
Smallholder Dairy Project (SDP) The focus of this DFID funded project)	Focused on research and policy issues of concern to the smallholder dairy production. Promoted informal milk market developments.	Select areas of central	(1997 2005	

NB

The activities of the dairy sector are not coordinated effectively except through the networking efforts made by different players and actors to work together for mutual benefit. The dairy board and the livestock ministries are expected to play this role but like the entire extension service there is no effective legislation to accomplish this function.

CHAPTER 4 MAJOR CHALLENGES AND INVESTMENT OPPORTUNITIES

4.1 Introduction

The growth in Kenya's dairy sector has been heralded as a great success story, and yet further gains in dairy production and marketing are constrained by a wide range of problems. These include poor quality feeds, barriers to animal health services, slow development of breeding services and poor access to credit and milk markets. Many existing dairy policies pre-date independence and tend to be discriminative, with standards biased towards the formal sector. Road infrastructure also remains poor, and it is estimated that for every kilometre of poor feeder road farm-gate milk prices are reduced by three per cent. Despite current constraints, the smallholder dairy sector in Kenya has potential to be competitive can provide good returns if the opportunities identified in this study are addressed at various parts of the chain.

4.2 Investment Opportunities at Farm Level

At the farm level the highest investment in the value chain is by the dairy farmers who collectively own over 0.9 million dairy animals. If the value of one dairy animal is taken to be approximately Kshs. 50,000 the total net investment is close to 45 billion Kshs. However the yield per animal and efficiency in dairy farming is very low and many farmers lack the requisite dairy husbandry knowledge and management for efficient and competitive dairy farming. Therefore sustainable investments in the dairy must of necessity address productivity improvement at the farm. Some of the viable investment opportunities identified at this level (Methu, 2010) include:

- Improving overall management of the smallholders farms through well directed extension approaches
- Establishing/managing dairy farms- This would involve buying/leasing land, setting up water supply and electricity and all other infrastructure if not available and developing appropriate farm plans
- Providing farm enterprise management services as private consultants

4.3 Investment Opportunities in Breeding

This study estimated that the current adoption level for AI Services is only 30%. The apparent low adoption level of AI is mainly due to lack of awareness, unavailability of AI Services in

some areas and high cost of the services as well as ineffective supervision of AI Service Providers and CAIS Agents by the relevant authorities. Many farmers have expressed the desire to improve their breeds and some have taken serious measures towards this direction.

Figure 8: One of the Farmers Groups That Wish to Pursue Breeding as a Business

Considered investment in this area would therefore include

- Sale of semen, breeding equipment, breeding supplies (gloves, pistulates, synchronization hormones, etc).
- Running AI services (Challenging, dependent on knowledge of farmers, feeding of animals)
- Production and distribution of liquid Nitrogen. The country needs to increase the out put of Liquid Nitrogen and its distribution to AI Service providers at affordable prices.
- Partnerships with the East African Semen & Embryo Transfer Association (EASETA) to fastrack embryo transfer activities.

The above opportunities can only be developed through well targeted individual entrepreneurial development interventions as well as support to the emerging dairy groups by the university and other technical service providers

4.4 Investment Opportunities in Dairy Feeds

The production cost of smallholder dairy farmers has been reported to be very high compared to other forms of rearing systems and feeding alone, accounts for 70% of the variable cost of production in a dairy animal (Karanja 2003, Marija et al 2009, and this study). In central Kenya many small scale farmers feed their animals for maintenance alone leading to low productivity since commercial feeds are very expensive. If milk production on smallholder farms is to be

made a viable venture, sources of cheap, affordable and nutritious feed has to be sought. Investment in this area includes:

- Intensify pasture growing, and include a variety of other forages such as nappier grass, maize stovers, sweet potato vines, calliandra, Lucerne and desmondium which can be used to supplement and provide a balanced diet to a dairy cow
- Enhance fodder preservation for the dry seasons through intensified dissemination of conservation methods which are effective and easily applicable at the farm level
- Investments in storage facilities for natural fodder should be considered to allow storage of fodder during the wet season for use in the dry seasons
- Promotion of home feed ration making through intensified training.
- Purchase feed mixers for making home made ration using locally available materials by farmers, groups private youth entrepreneurs.
- Encouraging cooperatives and farmer groups to put up small feed mills
- Local production of vitamins, amino acids, macro and micronutrients for the feed mills can also be a viable investment for large scal investors.

Figure 9: Dairy Inputs Store at Tulaga Farmers Society

The intervention strategies at farm level would entail educating the smallholder dairy farmers on how to grow fodder crops, popularising silage making and hay as a way of feed preservation as well as the promotion and adoption of home made rations.

4.5 Investment in Cooling and Bulking

To have a successful dairy sector, an efficient cold chain is essential. Very few farmers have invested in cooling facilities at the farm level. However, there exists cooling and bulking

facilities predominantly owned by the cooperative societies and major milk processors. It is estimated that lack of proper cooling and bulking facilities results in 40percent waste of raw milk produced (Technoserve 2005, IFC 2008). Generally literature indicates that bulking, cooling and transport systems for milk are weak and investment in this area is haphazard and not properly organized. The cold chain in the dairy sector is not well developed and therefore a lot of milk goes to waste and does not reach the market. This study found out that over 50%of the already installed coolers are not operational due to lack of spares, high cost of chilling milk, irregular milk volumes and poor management. There is need to carry out proper feasibility before any chilling facility is established to determine the quantity of milk available, the cost of chilling and efficiency. The segment of the value chain is also dogged by other challenges such as high cost of transport to bulking centres, low quality milk due to poor handling through informal systems, delayed access to markets, excess milk wastage and seasonal fluctuations in milk supply leading to disruptions in the supply and marketing chain.

Figure 10: Milk Cooler Installed by KCC for Kahuro Farmers Society

In the rural parts of the region, infrastructure especially roads are in a state of disrepair. This makes transportation difficult and a lot of milk is wasted at farm level. Lack of electricity is also another major problem and this makes it difficult to invest in cooling facilities that generally run on electricity hence need for alternative sources of energy and technologies. The most viable investment opportunities in this part of the chain would include purchase of refrigerated vehicles, establishing small cooling and bulking facilities, sale of equipment and provision of technical support.

4.6 Investment Opportunities in Processing

According to industry figures, close to 2.2 billion litres of milk is produced in the region annually. The national installed processing capacity of all dairy processors in the country is estimated at 3.0 million litres per day. It is, however, estimated that only 30 percent of this potential capacity is utilized by dairy processors. Generally it is possible to expand milk production in the short run without substantial investment in processing facilities. Tetra Pak has controlled packaging for dairy products in Kenya for many years. However, recent emergence of the pouch technology has seen a shift of packaging business from Tetra Pak. The market has accepted the pouch technology and all major processors are now investing in the technology. Githunguri Dairy Limited as the market leader in the pouch technology has demonstrated that consumers respond positively to technology that reduces the retail price of processed milk. Investment opportunities in processing exist for pasteurization and value added products such as powder milk. KCC is a dominant player in the milk industry and is also the only processing factory producing powder milk. It has been observed that for KCC to operate efficiently, it requires investment in modernization and rehabilitation of its equipment. In summary the most vital need in the industry is the rehabilitation and expansion of powder and long life milk processing capacity to cater for surplus milk production. High processing costs due to low capacity utilization, high cost of packaging materials limits market access to the higher income groups in the urban centres, especially Nairobi.

4.7 Transport and Logistics

The investment in the transport and logistics (farm-cooling-processor-consumer) seems to be the weakest link in the value chain. The investment is haphazard and it is a mixture of all manner of transport systems. This is also the point, where many middlemen take the opportunity to do business, and in many cases cost of transport between farm and collection point/dairy cooperative/dairy processor buying point is quite costly and is between Kshs 1 to 3 per litre and in some other cases even more. Players in the formal milk market are disadvantaged compared to the informal players who do not incur these costs. Except for the major processors who have invested in cooling tankers, others generally transport the milk outside the cold chain and this encourages the use of preservatives and adulteration. For distribution of milk to consumers most processors use a combination of own and hired transport. A business model that embeds the

transport and logistics services in the dairy sector will be necessary to increase efficiency and productivity in the value chain.

4.8 Financial Services

The dairy sector has been supported with financial services at different levels. The dairy farmer generally gets supported through the cooperative society by assessing services in advance and paying for them on a check off system. Recently banks such as Equity Bank and K-REP bank have also developed products for dairy farmers using a check off system with some embedded evaluation of the farmer operations by institutions such as Land O' Lakes and Technoserve. The initial investment in cooling and bulking facilities for the cooperatives were supported through grants from Finland but the processors have funded their cooling plants from own or borrowed funds from commercial banks. Investment in processing capacity is generally supported through borrowed funds from commercial banks. Figure 10 shows a summary of the key investment opportunities.

Fig 10. Summary of investment opportunities

Nature of Challenge the Dairy Value Chain	**Required Investment**	**Nature of Investment**	**Key Players Remarks**
1. Low productivity due to poor breeds, poor access and high cost of breeding services such as AI s	Development of registered breeds among farmers	Social	Trainers, breeders, Kenya studbook, JKUAT
	Improve contractual arrangement between farers and AI providers	Social	Trainers, breeders, universities
	Assist farmer groups to establish and mange AI services	Social	Trainers, breeders, Kenya studbook, JKUAT
	Fast-rack embryo transfer activities	Private sector	AESETA, Veterinarians, entrepreneurs
	Sale of semen, breeding equipment, breeding supplies (gloves, pistulates, synchronization hormones,	Private sector	Veterinarians, entrepreneurs
2. High cost of feds and feed quality fluctuations	Introduce and popularise improve pasture species	Social	Extension trainers, NGOs, universities researchers
	Build capacity for fodder conservation among farmers	Social	Extension trainers, NGOs, universities researchers
	Adoption of feed rationing at farm level	Social	Extension trainers, NGOs, universities researchers

	Start cottage feed industries	Private sector	Entrepreneurs, coops, banks
	Local production of vitamins, amino acids, macro and micronutrients	Private sector	Large scale investors.
	Investment in feed storage facilities	Private sector	Large scale investors
3. Poor livestock husbandry practices	Capacity building	Social	Extension trainers, NGOs, universities researchers
4. Lack of proper cooling and bulking facilities	Establish cooling and freezing facilities especially for the dairy CIGs	Social but providing soft loans	Development partners
5. Transport challenges	Purchase refrigerated vehicles	Private sector	Entrepreneurs
6. Low capacity for powder milk processing	Establish and expand powder milk processing	Private sector	Processors , banks, development patners
7. Low Utilization of installed processing capacity	Expand milk production	Social	Extension trainers, NGOs, universities researchers, farmers
8. Narrow range of processed products	Expand the products	Private sector	Small processors, large processors
9. High cost of processing	Adopt cheaper packaging	Private sector	Processors research institutions
10. Weak domestic market,	Promote milk drinking culture	Private sector/social	Public and private sector
11. Failure to penetrate regional markets	Diversify into the regional markets	Private sector	Processors government, development agencies

CHAPTER 5: CONCLUSIONS RECOMMENDATIONS AND WAY FORWARD

5.1 Conclusions

The smallholder dairy subsector in central Kenya region and the country as a whole has immense potential. This is because the region has a large concentration of smallholder farmers (600,000) with a positive dairy farming culture, who own a large flock of dairy cattle breeds with potential for improvement, and a facilitative policy and regulatory environment. The climatic conditions are also favourable for dairy farming and the degree of commercial orientation in farming and level of appreciation for dairy farming is rather high. This means that the farmers if motivated can be made to fully exploit this potential and improve their overall livelihoods and move towards attainment of millennium development goals. To realize this potential, however, the industry needs to address the challenges already identified. Based on extensive and intensive interviews, field visits and data collected the following major challenges and observations at the farm level were recorded

1. Low productivity due to poor breeds, poor access to breeding services such as AI and Embryo transfer, high cost of AI services, inadequate heat detection knowledge, poor dairy husbandry practices and lack of skills.
2. Poor access to quality feeds due to high cost of commercial feeds unreliable feed quality, low quality fodder, rainfall induced seasonal availability of fodder, limited fodder conservation and lack of organised feed supply systems.
3. Poor disease and health management skills coupled with poor housing for dairy cattle

   At the marketing level the key challenges include
4. Poor market accessibility due to low milk volumes and absence of organised milk marketing farmer groups. This results in low farmgate prices, fluctuations in prices and irregular payments. Producer price fluctuations have especially those experienced during the milk surplus period will create a disincentive for farmers to produce consistent quality and quantity.
5. unreliable milk hawkers and traders controlling over 60% of the milk market, quality control challenges both at farm level and major handling phases upto the chilling hubs, huge wastage of milk due to poor transportation and inadequate cooling facilities, poorly drafted milk

delivery contracts which only protect the buyers, low prices below the break even points and weather based fluctuation of milk quantities leading to shortages during dry season, and milk "gluts" during the wet season

6. Bulking, cooling and transport systems for milk are weak and investment in this area is haphazard and not properly organized. The cold chain in the dairy sector is not well developed and therefore a lot of milk goes to waste and does not reach the market. Road infrastructure in some of the regions like Nyandarua is poor and where it exists it is dilapidated. Some of the rural areas lack electricity that is necessary in supporting the cold chain through cooling and refrigeration.
7. Weak domestic market due to low per capita consumption of approx 100lts per annum, little surplus for external markets
8. High cost of packaged milk making consumers prefer the raw milk despite awareness of quality challenges and over reliance on fresh milk as the main product of marketing.
9. Inability to penetrate the export markets due to low milk volumes and low capacity to process long life and powder milk

At the processing level the following observations were recorded

- There is substantial investment in processing capacity especially for pasteurization and value added products. However the present processing capacity is grossly underutilized and is currently operating on average at 40percent of installed capacity.
- KCC is a dominant player in the milk industry and is also the only processing factory with the capacity for producing powder milk.
- For KCC to operate efficiently, it requires investment in modernization and rehabilitation of its equipment in order to cope with surplus milk processing during wet seasons
- To produce powder milk at a competitive price the factory must also be modernized.

To compete in the regional market, in particular, the industry must reduce the cost of production. The high cost structure is mainly caused by inefficiency in the value chain.

Other aspects that should be addressed include the quality of processed milk and dairy products; new products development; and a focused marketing strategy. This requires clearly targeted investments in the sector. In particular strategies for availing marketable milk quantities at the smallholder level, mobilizing the smallholders into efficient marketing chains, increasing farm

level milk productivity as well as reducing the cost of production in the value chain need to be clearly identified. This requires clearly targeted investments in the sector. There seems to be a gap in financing farmer level activities although farmer cooperatives, microfinance institutions and banks such as Equity and K-REP and have now developed many products for this part of the chain.

5.2 Recommendations

1. There is need to improve the dairy breeds genetic and production potential as desired by farmers, raise milk production per cow, attaining marketable milk volumes and enable farmers to earn premium prices.
2. There is need to intensify technical assistance in the area of organizational development especially for the emerging well intentioned farmer groups, to play an effective role and settle down into formal structures in the industry. One particularly urgent issue is to form farmer affiliations which can work together and negotiate better contracts with milk buyers
3. These groups and the industry in general also require sustained technological support to continuously identify and use the most cost effective technologies. These include improved breeding methods, better quality fodder; feed rationing and alternative energy sources especially for chilling milk such as use of solar coolers wind energy among others. well as market development, quality assurance and marketing strategy. There is need for enhanced but focused technical assistance by various partners including Kilimo trust to support viable technological and group development initiatives that this study asserts are value for money and certain to create impact sooner than later. Each of such initiatives would require a focused project document showing logical interrelationships. The study team and JKUAT in particular are gearing towards such initiatives as will be reflected by specific proposal developed in the area.
4. Long-term development support through cold chain development is of utmost benefit to the sector but efforts towards this are being spearheaded by the EADDP. Of critical importance is also bottom up support to farmers to supply sustained milk volumes and ensure long-term sustainability of these facilities
5. Farmers are involved in activities across the chain. The cooling chain facility where all services are supplied through business partnerships remains the most viable model for promoting smallholder dairy farming.

6. Regular data gathering be undertaken to ensure that that major indictors such as cost of production best combinations, and most appropriate technologies are monitored and used to inform decision making in the industry
7. At the national level strategic long-term measure to stabilise the industry are required. These include promotion of local milk consumption, establishment of school milk programmes, inclusion of dairy products in the stocks of national food strategic reserves, improvement of roads network and infrastructure as well as development and implementation of quality control mechanisms for the industry

5.3 Way forward

The team proposes the following way forward

1. Dissemination and sharing of the report.
2. Final consultations with all the partners to select the interventions to undertake
3. Development of specific targeted intervention activities through concept proposals to Kilimo Trust and other development partners
4. Implementation of the strategic initiatives

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Appendix 1: Appendix 2. Sample Invitation letter to the Dairy Stakeholders Workshop

***JOMO KENYATTA UNIVERSITY OF* AGRICULTURE AND TECHNOLOGY**

Office of the Deputy Vice Chancellor Research, Production & Extension Division

P.O Box 62000-00200-Nairobi Kenya. Tel 067-52181-4 email dvc@rpe.jkuat .ac.ke

Date: 10th October 2011 Ref. JKU/2/050/010

Moses Nyibira
Regional Director EADD

Re: Invitation to Attend a Stakeholders Workshop

Jomo Kenyatta University of Agriculture and Technology (JKUAT) and some partners are carrying out a value chain study of the smallholder dairy industry in central Kenya to determine investment opportunities and modalities for resolving the challenges facing the sector.

In order to share and develop stakeholder consensus on key challenges and opportunities in the sector in central Kenya region, a stakeholders workshop has been organized to bring together key stakeholders including processors, dairy sector apex organisations, development agents, policy makers and some researchers.

I have the pleasure to invite you for the workshop to be held 28th October 2011 at the African Institute for Capacity Development (AICAD)(within JKUAT Main campus at JUJA) between 9am -2pm.

Please confirm your participation through email jeremiahnyori@yahoo.com or by calling the Abraham Wahid on 0720 412 790 or Maria Njuguna on 0715 694 412. If unable to attend please send an able representative from your organisation.

We look forward to meeting you.

Yours faithfully

JN Mbugua

Team Leader –Dairy Project Study

For Deputy Vice Chancellor Research, Production and Extension Division

Appendix 2: Programme for the Dairy Stakeholders Workshop

PROGRAMME FOR STAKEHOLDERS' WORKSHOP ON: STRATEGIC VALUE CHAIN STUDY OF THE SMALLHOLDER DAIRY SECTOR IN CENTRAL KENYA.
Date 28th October, 2011
Venue AICAD. JKUAT

TIME	ACTIVITY	FACILITATOR
	First session	
8.30 -9.00 am	Arrival and Registration	Secretariat
9.15 – 9.20 am	Welcoming Remarks and Invite Speakers	Ag. Registrar (RPE)- Mr Kamau
9.20 -9.30 am	Highlights on Dairy Sector	DVC(RPE)- Prof EM Kahangi
9.30- 9.40 am	Remarks by Kilimo Trust Representative	Michael Kairumba
9.40- 10.00 am	Remarks by Provincial Director of Livestock Production-Central Province	Mary Wacera Kanyi
10.00 - 10.30 am	Keynote Speech by Chief Guest	Mr. Machira Gichohi – MD Kenya Dairy Board
10.30 – 11.00 am	**Tea Break**	
	Second Session	
11.00 a.m-12.00	Highlights about the Dairy Study	• J. N. Nbugua • Dr. F. K. Njonge • Dr. K. Muchemi (breeding Challenges and opportunities
12.00-1.30	Group Discussions	All participants
1.30 pm -2.00 pm	Presentations	Group Rappoteurs
	Way forward	Team
	Closing Remarks	J.N Mbugua
2.00 - 2.30 p. m	**Lunch**	
2.30 pm	Departure at own Pleasure	

Master of Ceremony – Mr CC Kamau- Ag Registrar Research Production and E

Appendix 3. Written Recommendations from stakeholders on various issues

3.1. It was suggested that to improve the genetic potential of the dairy sector the following need to be addressed:

- Make the AI service much more efficient.
- Streamline the AI services by regulating the prices, to make it affordable and accessible to majority of small scale farmers.
- Subsidize the cost of the AI to make it affordable to majority of farmers
- Avail quality geneticist and diversify the genetic pool.
- Train farmers on the importance of record keeping..
- Intensify cattle registration services.
- Provide a detailed menu of bulls to farmers.
- Invest in research on breeding to determine the optimal production for each breed.
- Harmonization of extension services on breeding by the relevant ministry departments.
- Increase the number of livestock registration personnel.
- Increase the number of breeding stations in the country.

3.2. It was suggested that to lower the cost of feeding cow, the following measure should be undertaken:

- Develop homemade feed formulations and develop better livestock breeds.
- Improve on fodder conservation and adoption of better irrigation systems.
- Improve on the breeding methods.
- Encourage cattle registration to add value to the breeds.
- Intensify fodder production so that purchased seeds/fodder account for less cost than production.
- Train farmers on feed conservation and feed rations depending on the specific materials available.
- Deal with malpractices in milk processing by prosecuting the culprits.
- Increase farming of fodder trees to supplement the available feed which is mainly inform of nappier grass.

3.3. To increase milk yield to twice the present production level, the following measures were suggested:

- Adopt modern breeding technologies and better milking machines.
- Improve the nutrition of the breeding heifers and lactating cows.
- Better husbandry practices.
- Improve on the genetic pool by cross breeding hybrids only.
- Improving on the feed formulation.
- Use high quality fodder.
- Train farmers on proper feeding regime.
- Invest in local fodder production.
- Ensure optimal feeding of the cow.
- Increase usage of legume fodders instead of depending on the commercial feeds.
- Increase the price of milk to encourage more farmers to diversify into the dairy sector.

3.4. The role of JKUAT in the dairy sector was also discussed. The workshop resolved that: JKUAT should:

- Increase and diversify research geared towards livestock improvement and touching the farmer directly
- Should training on extension and animal health area, being an agricultural related institution.
- Carry out more studies on livestock improvement and avail the results to the stakeholders.
- Be actively involved during district stakeholders' forum.
- Train and encourage youth groups to venture into the dairy sector.
- Partner with other stakeholders to add value to the animal products.
- Solicit for researchable issues from the stakeholders.
- Strengthen linkages with the stakeholders.
- Disseminate research findings to the end user through publications and extension work.
- Arrange for continuous short term training for interested farmers on issues touching the dairy sector.
- Update the learning curriculum to include small scale dairy farming as a learning subject among the graduates.
- Encourage the young graduates to venture into the dairy industry as a form of self employment.

3.5. To double the quantity of processed milk in the region under study, the discussants suggested the following:

- Provide credit to farmers; promote cottage industries and encourage aggressive marketing.
- Lower the cost of the processing equipment by reducing or waiving all duty and tax.
- Create awareness on the need to consume processed milk so that the demand increases.
- Lower the price of the processed milk.
- Organize farmer groups to bulk their milk and sell as a group.
- Ensure farmers improve their milk production techniques.
- Use of low cost but reliable packaging materials.
- Jointly lobby for policy change towards the dairy sector.
- Process long life milk for longer keeping especially diring the wet season when the milk is in plenty.

3.6. Measure to undertake to lobby to the government for the dairy subsector. The Government should:

- Incorporate dairy products as part of the strategic reserve.
- Increase extension service.
- Engage with other stakeholders and find out how to improve the quality of the milk.
- Increase funding for the livestock sector.
- Keep data on how the economy is growing in relation to the dairy sector.
- Form dairy sector federation which should be the voice of the farmer.

- Set up professional bodies that can engage political leaders in lobbying the government.

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3.7. Other pertinent issues which are necessary in the revitalization of the sector:

- Carry out intensive research on diversification of processing equipment by adopting locally assembled equipment.
- Increase the number of farmers attending such kind of fora.
- Engage with law makers on the issue of dairy development.

Appendix 4: List of Participants to the dairy Stakeholders Workshop

Dairy Stakeholders Workshop (Participants)					
No	Name	Company	Location District	Phone No.	Email
1.	Dr. F.K. Njonge	JKUAT		0721858516	Francisnjonge@yahoo.com
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19.	Mr. G. Muya (GM)	Mukurweini Wakulima dairy Ltd		0722380025	Wakulima@yahoo.com
20.	Mr. Njire Maina (MD)	Aspendos Dairy Ltd		0722770465	Maxwel.dmk@gmail.com
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