DAIRY DEVELOPMENT IN UGANDA

The Republic of Uganda

Ministry of Agriculture Animal Industry and Fisheries (MAAIF)

Food and Agriculture Organization of the United Nations

Dairy Development Authority (DDA)

A Review of Uganda's Dairy Industry

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ACRONYMS AND ABBREVIATIONS

ACSS	Agricultural Consultation and Sector Structuring Project
AI	Artificial Insemination
CBO	Community Based Organisation
CPSP	Cooperative Program Support Project
DDA	Dairy Development Authority
EADD	Heifer International/East Africa Dairy Development Project
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
IGAD	InterGovernment Authority on Development
LOL	Land O' Lakes
LPI	Livestock Policy Initiative
Ltd	Limited
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MCC	Milk Collection Centre
MTTI	Ministry of Tourism, Trade and Industry
NAADS	National Agricultural Advisory Services
NGO	Non Governmental Organisation
SACU	Send A Cow Uganda
SMEs	Small and Medium Enterprises
SNV	Netherlands Development Organisation
UCCCU	Uganda Crane Creameries Co-operative Union Ltd
UDPA	Uganda Dairy Processors' Association
UGX	Uganda Shilling
UN	United Nations
UNDATA	Uganda National Dairy Traders Association
UNDFA	Uganda National Dairy Farmers Association
US	United States
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

EXECUTIVE SUMMARY

Agriculture is the main stay of Uganda's economy, however, the share of agriculture in the national Gross Domestic Product (GDP) has been declining steadily. In fiscal year 2009/10, agriculture contributed only 14.6% to the national GDP of which 1.3% was attributed to the livestock sub-sector. The dairy industry is estimated to contribute more than 50% of the total output from the livestock sub-sector. The dairy industry employs many people who are engaged in various economic activities along the dairy value chain, particularly in milk production, collection, bulking and transportation, processing, distribution and marketing as well as provision of inputs and support services. The industry has witnessed tremendous improvement over the last decade, growing at an average rate of 5-7% per annum as a result of the favorable macroeconomic environment, policy and institutional reforms as well as numerous targeted interventions to promote development of the industry by government and the private sector. The dairy industry benefitted from many well-coordinated donor funded development programmes which facilitated a quick recovery from the effects of civil strife experienced by the country between 1972 and 1986.

The private sector is currently the key player in development of Uganda's dairy industry. It is responsible for development infrastructure for milk transport, bulking and processing; marketing and market promotion; supply of inputs; as well as provision of advisory and business development services particularly animal health, breeding, farmer training and financial services. Government only plays a facilitating role, creating an enabling/ conducive environment for private sector participants, through formulation and implementation of good laws, policies, regulations and standards. The public sector also plays a key role in research, education, and public infrastructure development. Following liberalization of the dairy industry in 1993, the private sector established more than (15) dairy processing plants in different parts of the country. However, five of the ten plants established in the first decade of liberalization collapsed or were sold by the original investors. The major dairy industry players include dairy farmers, milk traders, dairy processing companies, milk producer cooperatives, associations of milk processors and traders, public institutions, NGOs, and input manufacturers/ distributors.

The Dairy Master Plan which was adopted in 1993 is still the main document guiding development of Uganda's dairy industry. Some of the major recommendations of the Dairy Master Plan that have been implemented include liberalization of the dairy industry, restructuring and commercialisation of the state owned dairy processing company, and establishment of a Dairy Board. The Dairy Industry Act, 1998 provided the legal framework for implementing recommendations of the Dairy Master Plan, including establishing Dairy Development Authority (DDA) as a semi-autonomous statutory body mandated to develop and regulate Uganda's dairy industry. DDA is currently implementing the "The Dairy (Marketing and Processing of Milk and Milk Products) Regulations, 2003".

Over the last ten years, Uganda' dairy industry has witnessed tremendous improvement as a result of the numerous public and private sector led development interventions, including implementation of reforms aimed at improving the quality of milk and enhancing market access. The cattle population has been growing at an average rate of 7.4% per annum from 5.96 million in 1999 to 11.34 million in 2008 while milk production has been growing at an

average rate of 4.9% per annum from 637.8 million litres per annum in 1999 to an estimated 1.08 billion litres per annum in 2010. According to the 2008 national livestock census, 1.663 million households keep cattle, representing 26.1% of all households in the country. The average household size in Uganda is 6.9 persons. Women and youth are the major players at farm level, not only providing labour but also heading a significant proportion of cattle rearing households. Majority (92.7%) of the cattle-owning households keep indigenous cattle. Only 10% of the cattle rearing households keep improved dairy breeds. The total number of improved dairy cattle (exotics and their crosses with indigenous breeds) was estimated at 0.62 million in 2008, representing 5.47% of the national herd of 11.34 million. Majority (48.5%) of the exotics and crosses are found in the western region, followed by central with 30.0% and eastern with 20.1%. Indigenous cattle are almost equally distributed amongst all the regions. However, the northern region has slightly fewer indigenous cattle than other regions. The total number of indigenous cattle was estimated at 10.64 million in 2008, representing 93.3% of the national herd.

The major indigenous cattle breeds are the Ankole (Sanga), Small East African Zebu and Karamojong. Other indigenous types include Nganda, Nkedi, Kyoga, Nyoro, Kigezi, and Lugware. Despite their poor production and reproductive performance, indigenous cattle are still the most popular in Uganda because of their versatility and adaptability to the local climatic and disease conditions. Indigenous cattle also serve many social and economic functions. They are kept for milk, beef, manure, draft power and various social functions. The most popular exotic dairy breed is the black and white Holstein Friesian. Other common dairy breeds include Jersey, Guernsey and Ayrshire.

The total number of milked cows was estimated at 1.52 million or 32.8% of all adult cows in 2008, with the western region had the highest number of milked cows estimated at 0.41 million followed by central (0.38 million) and eastern (0.31 million). The northern region had the smallest number of milked cows (0.16 million). Milk produced by exotics and crosses accounts for 30.2% of the national total while production by indigenous cattle accounts for 69.8%. The total national milk production estimate for 2010 was 1.08 billion litres. With 364.06 million litres per annum, the western region is the major milk producing region, accounting for 33.7% of the national production followed by central with 341.89 million (31.6%). Karamoja region produces the least amount of milk (75.28 million litres per annum) (7.0%)

Dairy production systems in Uganda may be classified into two broad categories, namely i) “traditional” milk production systems and ii) “commercial” milk production systems. There are four types of traditional milk production systems namely small-holder extensive, medium-holder extensive, pastoralist (semi nomadic pastoralist) and agro-pastoralist. The main features of the traditional production system in Uganda include the small herd sizes mainly of indigenous cattle, small land holdings, low animal productivity, and dependency on family labour. Traditional production systems mainly serve informal milk markets. They are also characterized by the multi-objective nature of farmer behaviour, low-input low-output levels and nutrient deficiency at both farm and household level.

There are three categories of commercial milk production systems namely small-holder intensive, medium-holder intensive and large-scale (commercial) producers. Commercial

production systems are generally characterized by larger herds, greater reliance on hired labour and on a greater range of purchased inputs and services; single objective enterprise nature of farmer behaviour, high levels of both inputs and outputs and nutrient surpluses at both farm and household levels. The small scale, zero grazing or stall feeding units that are common in Uganda represent an intermediate system, with features of both traditional and commercial production. Milk production in Ugandan is dominated by smallholder producers who own over 90% of the national herd and produce over 90 of the milk in the country. The average herd size in Uganda 6.9 per cattle owning household.

The most common method of feeding cattle is by grazing on natural or planted pastures. Stall feeding of indigenous cattle with cut fodder or concentrate feeds is not practiced in Uganda. Most farmers graze exotics and crossbred cattle in the wet season and introduce stall feeding in the dry season. Only 20% of the farmers stall feed exotics and crosses in both the wet and dry seasons. The prices of raw materials for making commercial concentrate feeds have been increasing steadily, making commercial feeds unaffordable to most farmers. Only a small proportion of farms, mainly in the central region where the farm gate milk price is high feed commercial concentrate feeds.

About 64.8% of the milk produced in the country is marketed, leaving only 35.2% at the farm. The milk which remains on farm is either consumed by the family, fed to calves, offered as gift, processed into traditional dairy products for home consumption or wasted due to spoilage. About 5.8% of the farm produce is wasted. The infrastructure for rural milk collection is not well developed in most parts of the country except the South Western region. A total of 398 milk cooling tanks with a total capacity of 591,000 litres are installed in rural areas for milk collection. The volume of milk collected and delivered to processing companies per day is still small compared to the total national production. The total daily intake of 14 processing plants and mini dairies is 244,664 litres, equivalent to 39.6% of their total installed capacity. A large proportion (35.4%) of the daily milk intake goes into production of pasteurized milk; followed by powder milk (34.2%), and UHT milk (24.2%). Only 15,319 litres per day (6.3%) is processed into other value added products including yogurt, cheese, and ice cream. Other products made include cream, butter, and ghee. The total volume of milk processed into value added products is only about 12.7% of the total marketed milk estimated at 1.92 million litres per day in 2010. Sameer Agriculture and Livestock Limited (SALL), is the largest processor, handling 68% of the total daily milk deliveries to processing companies. About 87.3% of the marketed milk in Uganda is sold through the traditional/ informal market. Per capita consumption is estimated at 35 litres per person per year.

Uganda continues to import a significant quantity of milk and dairy products although the trend shows progressive decline. In 2008, Uganda imported 2,332 tons of dairy products worth UGX 8.7 billion. The volume of exports has increased dramatically since Sameer Agriculture and Livestock Ltd started production and export of powder milk in 2008. The value of milk and dairy products exported in 2008 was estimated at US$ 5 million, effectively surpassing the value of imports.

Market access for smallholders is still a major challenge owing to the poor state of rural feeder roads, lack of infrastructure for rural milk collection and transportation as well as poor organisation of milk producers in most parts of the country. Other challenges include

low milk production and productivity of animals, limited or poor access to good quality breeding stock, farm inputs, and livestock support services, particularly animal health, breeding and financial services. The growing shortage of labour and land for dairying are among the major challenges to dairying in most parts of the country.

Karamoja region faces unique dairy sector challenges owing to the level of socio-economic development, cultural, security and agro-ecological factors. Insecurity is the main challenge to dairy production. Others include the prolonged drought and poor state of infrastructure particularly the road network, and water for livestock

In conclusion, Uganda has a huge potential to produce enough milk to adequately satisfy the domestic demand and export a significant surplus to regional and international markets. Uganda's major comparative advantage lies in the favourable production environment and the strategic geographical location within the heart of Sub-Saharan Africa. Uganda is one of the major dairy producing countries in Africa. It is one of the few African countries that have attained 100% self-sufficiency in the production of milk and indeed, one of the few countries in the world that are low-cost producers of milk.

One of the major challenges to Uganda's dairy industry is the dominant traditional, smallholder production system and informal market. Dairying could play a greater role in the economy, particularly providing regular income and employment opportunities for resource poor households. There is a huge potential to increase dairy production and productivity if adequate attention is paid to promoting access to markets as well as to good dairy breeding stock, improved dairy technologies and efficient advisory and business development services particularly animal health, breeding, finance, markets and marketing infrastructure.

All future efforts to develop Uganda's dairy industry should give priority to addressing market access constraints. It is necessary to invest in organizing milk producers to form member-based organizations, set up rural milk bulking and chilling infrastructure and promote collective marketing. It is necessary to train producers and market agents on hygienic milk production and handling, facilitate acquisition of appropriate milk handling equipment and link producer marketing organizations to reliable markets.

A lot of support is required to address the challenge of low milk production and productivity of dairy animals. Among the recommended interventions is training of dairy farmers on management and feeding of dairy animals, production and conservation of fodder, as well as development of water sources at both farm and community level. Karamoja region requires greater investment in peace building initiatives amongst pastoralist communities, as well as improvement of infrastructure, particularly roads and water for livestock. DDA is urged to strengthen the implementation of dairy sector regulations and standards in all regions especially by collaborating with organizations of dairy stakeholders to ensure sustainability.

CHAPTER 1

1. INTRODUCTION

1.1 Geographical Location of Uganda

Uganda, named “the Pearl of Africa” by W. Churchill, is a small landlocked East African State lying astride the equator, between latitude 4°12' North and 1°29' South, and longitudes 29°34' East and 35°0' East. The country covers an area of 241,551 sq. km of which 199,323 sq km is the land area and 44,228 sq. km is swamp and open water. Much of Uganda can be classified as a plateau, with numerous small hills and valleys and extensive savannah plains. Most of the country lies above 900m above sea level generally sloping from South to North. The lowest point (Lake Albert) is 620m above sea level and the highest point on Mt. Rwenzori is 5,110m above sea level. Much of the country lies in the 'Interlacustrine Region' (Between the lakes) of Africa. This region receives abundant rainfall, and is rich in tillable land. The climate is typically tropical with abundant rains and two dry seasons (December to February, and June to August). The north-eastern region is generally semi-arid.

1.2 Contribution of Agriculture to the National Economy

Agriculture is the main stay of Uganda’s economy. However, the share of agriculture in the national gross domestic product (GDP) has continued to decline from 18.3% in fiscal year 2005/06 to 14.6% in 2009/10. Contribution of the livestock sub-sector to the national GDP has also continued to decline, from 1.5% in 2005/06 to 1.3% in 2009/10 at constant 2002 prices, although the share of livestock in the agricultural GDP increased from 8.4% in 2005/09 to 8.9% in 2009/2010 (MAAIF, 2010).

The dairy industry is estimated to contribute more than 50% of the total output from the livestock sub-sector. Many people are employed in various economic activities along the dairy value chain, particularly in milk production, collection, bulking and transportation, processing, distribution and marketing as well as provision of inputs and support services. There have been noticeable improvements in Ugandan dairy sector over the last decade. The dairy sector has continued to grow at an average rate of about 8% per annum. The steady growth is attributed to the favorable macroeconomic environment, policy and institutional reforms as well as numerous targeted interventions to promote development of the sector by government and the private sector.

1.3 Historical Overview of Dairy Development in Uganda

Government, the private sector and development partners have continued to play a crucial role in development of Uganda’s dairy industry. In the 1960s, well-funded and coordinated government schemes led to the emergency of a viable and profitable livestock sector. Government invested in the establishment of infrastructure such as dams, valley tanks, boreholes, dip tanks, quarantine stations, livestock markets, stock routes and holding grounds as well as stock farms and ranches. The private sector established over 3000

commercial dairy farms. However, there was a drastic decline in livestock numbers and near collapse of the livestock industry in the late 1970s and early 1980s due to political instability and civil war. The National Resistance Movement government which came to power in 1986 put in place a number of policies that created conducive environment for participation of various stakeholders in revival of the livestock industry.

1.3.1 Introduction of temperate (*Bos taurus*) dairy cattle

Initial efforts to increase milk production in the country started in the 1950s with the importation of temperate (*Bos taurus*) dairy cattle. However, popularity of the temperate stock among the local farmers was curtailed by their susceptibility to the local diseases and parasites coupled with the harsh tropical weather conditions and the high management costs.

1.3.2 Introduction of artificial breeding services

Plans to upgrade the genetic potential of indigenous breeds through crossbreeding with temperate breeds were initiated in 1953. This was expected to produce animals that were tolerant to the tropical heat and the local diseases and parasites. In 1960, government established the Animal Breeding Centre to oversee the administration of field artificial insemination (AI) services. The centre also collected and processed semen from selected indigenous bulls and genetically proven exotic bulls and had the responsibility of importing semen and AI equipment, training of AI technicians and producing nitrogen. Several field AI stations were also set up in different parts of the country.

Farmers were given a number of conditions to fulfil before they would get AI services, including complete bull control by castration or removal, fencing of pastures, adequate tick control and intensive herd management practices. Owing to the high cost of farm improvement, only farmers with good financial resources were able to benefit from the new technology. It should be noted that to date, improved dairy cattle are almost invariably found on fenced farms and smallholder zero-grazing/stall-feeding units.

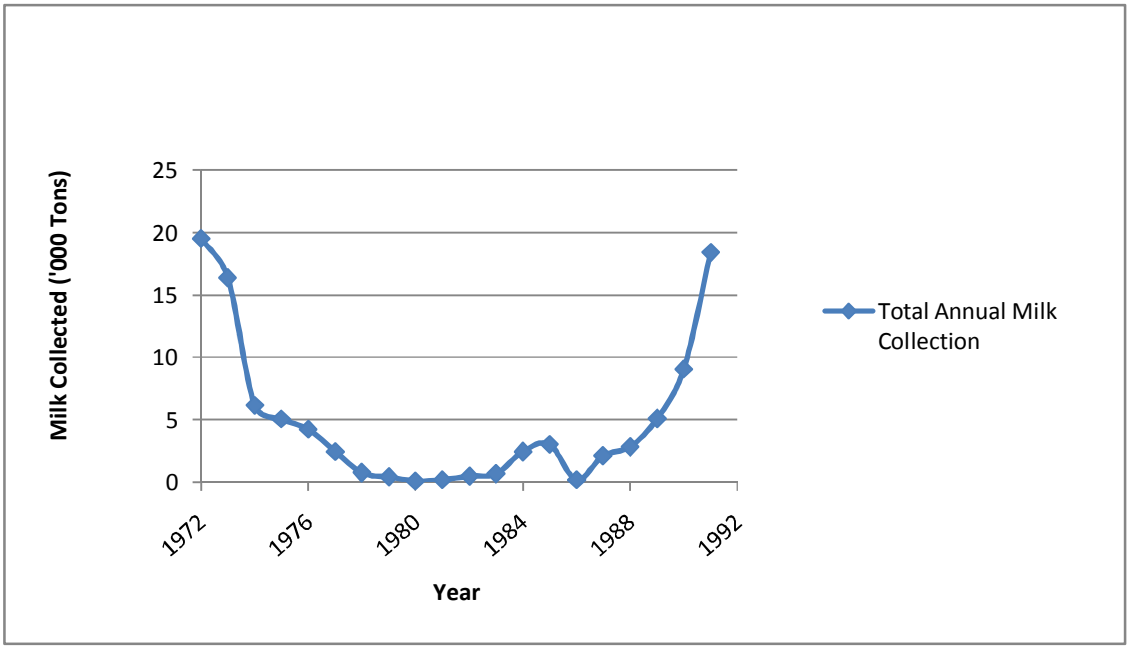
The immediate objective for crossbreeding of indigenous cattle with temperate breeds was to increase milk yields. No comprehensive national breeding program was established to produce animals that were adapted to the local conditions and this has been partly responsible for the high mortality rates of improved dairy cattle. To date, susceptibility of improved dairy cattle to the local diseases and parasites, particularly tick-borne diseases and trypanosomosis, and the high management costs remain the biggest impediment to development of commercial dairy farming in Uganda. Improved dairy cattle are still very unpopular among the poor farmers. The total population of improved dairy cattle was estimated at 5.47% of the national herd (MAAIF/UBOS National Livestock census, 2008).

Several dairy goat breeds were also introduced in the 1960s but these are now totally non-existent. Only a few hundreds of Toggenburg, Anglo-Nubian and Saanen breeds introduced recently by charity organisations can be traced in a total population of 12.5 million goats countrywide.

1.3.3 Establishment of Dairy Corporation

In order to improve the marketing of milk and stimulate increased production, government established a dairy processing company called Dairy Corporation in 1967. The Corporation was mandated to buy, process and market milk as a monopoly. It exercised legal powers over all participants in the milk market, set the producer and consumer prices, established milk collection, processing and marketing infrastructure, advised government on standards in the industry and oversaw the enforcement of quality, standards and regulations. The corporation started off very well such that by 1972 all the marketed milk was going through the company and there was no sale of loose unprocessed milk in urban areas. As the country experienced political and economic instability in the 1970s, the Corporation faced operational difficulties leading to a steady decline in the volume of milk collected and processed (See Figure 1). Between 1976 and 1986, the volume of milk collected and processed was quite insignificant, averaging less than 1 million litres per annum.

Figure 1: Total annual milk collection by Dairy Corporation



Source: MAAIF, 1992

In 1984 UNDP/FAO intervened through the World Food Programme by providing skimmed milk powder and butter-oil that were reconstituted into liquid milk and marketed. The financial proceeds were invested in rehabilitation of infrastructure for milk bulking, transportation and processing. The Corporation was restructured in 1998 and privatized in 2006 after tremendous improvement in performance. Its regulatory function was given to a new statutory body, the Dairy Development Authority as provided for under the Dairy Industry Act, 1998.

1.3.4 Rehabilitation of Uganda's dairy industry

Performance of Uganda's dairy industry declined severely during the 1970s and early 1980s, owing to the political and economic instability which adversely affected milk production, collection, transportation, processing and marketing as well as input supply and service provision. As a result, the population, particularly in urban areas could not access adequate supplies of milk and milk products. The National Resistance Movement government which came to power in 1986 prepared the National Rehabilitation and Development Plan for the period 1986-1990 which was later extended to 1992. The plan identified rehabilitation of the dairy industry as a priority programme whose overall goal was to regain self-sufficiency in milk by restoring farm level production, improving milk marketing and strengthening extension service delivery. Several multilateral donor agencies coordinated by UNDP and FAO contributed substantially towards rehabilitation/ development of Uganda's dairy industry between 1987 and 1993. The Government of Uganda, FAO, UNDP, World Food Programme, DANIDA, ADF, USAID and other donor agencies contributed to the GOU/UNDP/FAO Dairy Industry Development Project UGA/84/023 and the GOU/UNDP/FAO Rural Community Dairy Production and Marketing Project UGA/92/010. By the end of 1992, overall external donor commitment to dairy rehabilitation/development programmes had reached US $ 55.1 million (http://www.fao.org/docrep/T3080T/t3080T04.htm) of which US$25.94 million had already been released as follows: UNDP/FAO grant-US$ 5.04 million; DANIDA grant- US$ 5.2 million; WFP grant- US$ 9.7 million and ADB loan US$ 6.0 million.

World Food Programme (WFP) grant was provided in form of skimmed milk powder and butter oil that were reconstituted by Dairy Corporation and sold on the local market. The funds generated were channelled through the Dairy Development Committee (DDC) to support dairy extension and farmer training; importation of farm inputs for sale to farmers; purchase of milk collection vehicles and construction of milk collection centres for Dairy Corporation; renovation of Entebbe Dairy Training School premises; and maintenance of the DDC secretariat. Between 1988 and 1991, the World Food Programme provided skimmed milk powder and butter oil worth US$ 26.6 million and approved another US$ 29 million worth of dairy products for the period 1989-1993 (MAAIF, 1992). Danish International Development Agency (DANIDA) contributed towards rehabilitation of Dairy Corporation's milk processing plant in Kampala and upgrading of milk bulking facilities in Mbarara. DANIDA also provided funds to purchase equipment and machinery for Entebbe Dairy Training School milk processing plant, and financed a dairy sector study and Dairy Master Plan. The loan extended by African Development Bank (ADB) to the Ugandan Government was partly used to purchase insulated road tankers, refrigerated milk distribution trucks, coolers and laboratory equipment for Dairy Corporation. It was also used to restock and improve infrastructure on government farms. UNDP funding was used to support an FAO-executed technical assistance project - the Dairy Industry Development Project -whose role was to coordinate implementation the overall rehabilitation programme, in collaboration with the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Dairy Corporation, DDC and farmer groups. FAO provided several international and national specialists in dairy development, management and accounting, technology and engineering, production and veterinary science, extension and training, and marketing. Table 1 shows some of the major donor-funded development projects that have been implemented since 1986.

Table 1: Donor-funded dairy development projects in the livestock sector

Project	Sponsors	Period
Dairy Industry Development Project	ADB, UNDP, FAO	1987-1992
Rural Community Dairy Production and Marketing Project	UNDP, FAO	1988-1993
Livestock Services Project	IDA, World Bank	1991-1998
Rehabilitation of Dairy Corporation & Mbarara Milk Collection Centres	DANIDA	1988-1993
Dairy Master Plan Study	DANIDA	1991-1993
Pan African Rinderpest Campaign	ADB, EEC, FAO, IFAD, ODA	
Agricultural Development Project	FAO, UNDP, World Bank	
Immunisation against ECF	DANIDA	
Rehabilitation of Animal Health Research Centre	GTZ, ODA	
Integrated Tsetse and Trypanosomiasis Control along the Kenya/Uganda border	OAU/IBAR, ODA	
National Census of Agriculture and Livestock	IDA	
Continued Veterinary Education and training	GTZ and others	
Pan African Control of Epizootics (PACE)	EU	
Uganda Private Sector Dairy Industry Development	USAID	1994-2006
Agricultural Sector Programme Support (ASPS I & II)	DANIDA	1999-2009
Farming in Tsetse Controlled Areas	EU	
Agricultural Consulting and Sector Structuring (ACSS)	French Development Agency	2003-2007
National Livestock Productivity Improvement Project	ADB	2003-2008
Development of an updated National Strategy for the Dairy Sector and Dairy Value Chain Development, TCP/UGA/3202(D)	FAO	2010-2011

The coordinated donor support resulted in many significant achievements. (i) Dairy Corporation (DC) milk processing plant and 64 rural milk collection centres (MCCs) were fully rehabilitated; (ii) milk collection increased from 235,000 litres per annum to 28 million litres per annum; (iii) Funds obtained from the milk powder donated by WFP through the Dairy Development Committee (DDC), were used to fund implementation of various dairy development activities; (iv) Entebbe Dairy Training School and the associated milk processing plant were rehabilitated fully.

1.3.5 Recent developments in Uganda's dairy industry

Recent developments in the dairy sector are to a large extent attributed to implementation of the recommendations of the Dairy Master Plan, 1993 and enactment of the Dairy Industry Act, 1998. Following liberalization of the dairy industry in 1993, the government owned Dairy Corporation lost monopoly and control over dairy processing and marketing activities in the country. The private sector established more than fifteen (15) new dairy processing plants in different parts of the country. However, five out of the ten plants established in the first decade of liberalisation (1993-2003) collapsed/ closed down owing to various company specific and general industry inefficiencies (Twinamasiko, 2004).

Dairy Development Authority was established by the Dairy Industry Act, 1998 to address some of the inefficiencies in the industry. Since the secretariat of DDA started operations in 2000, many reforms in the handling and marketing of milk have been implemented including among others:

- Organization of the informal sector. Milk traders were mobilized through their umbrella body, the Uganda National Dairy Traders Associations (UNDATA) to undertake small-scale milk pasteurization using locally fabricated batch pasteurizers and to market loose pasteurized milk.
- Boiling of large volumes of milk in unhygienic environments was outlawed
- Use of plastic containers, particularly jerry cans for transporting milk was outlawed. Milk traders were advised to acquire aluminium or stainless milk cans which they purchased in large numbers.
- Regular inspection & monitoring of milk processing facilities and retail outlets by DDA was intensified
- Registration of milk processors, traders, transporters, importers & input suppliers was initiated
- Widespread training of dairy farmers and milk traders on hygienic milk production and handling was carried out
- Establishment of a functional analytical laboratory and regular taking of samples of milk and dairy products on the market and analysis of their quality and composition was initiated.

The Dairy (Marketing of Milk and Milk Products) Regulations 2003 being implemented by DDA and the code of hygienic practice for milk & milk products that was developed in collaboration with Uganda National Bureau of Standards (UNBS) have contributed significantly to the successful implementation of the above reforms. As a result of the improvements in the handling and marketing of milk, the country has witnessed a steady growth in the production and consumption of milk, as well as tremendous private sector investment in the infrastructure for rural milk collection, bulking and transportation. The milk processing capacity and volume of milk processed have has increased significantly and more milk and dairy products are exported mainly to regional markets and the Middle East. More details about recent developments in Uganda's dairy industry are described in subsequent sections of this report.

Suffice to note that the private sector is currently the leading actor in development of Uganda's dairy industry. It is involved in production and marketing of milk, supply of inputs, provision of advisory and business development services, market development and promotion, as well as development of infrastructure for milk bulking, transport, processing and marketing. Government plays a facilitating role, creating an enabling/ conducive environment for private sector participants, mainly through formulation and implementation of good laws, policies, regulations and standards. The public sector is also involved in building technical and managerial capacity along the dairy value chain mainly through training and research, as well as development of physical infrastructure of public good, particularly the roads network and community valley dams and tanks.

CHAPTER 2

2. INDUSTRY PLAYERS

The dairy industry has a complex web of actors. The largest and probably the most important category of dairy industry players are the farmers. Other key players include milk producer organizations, milk traders and their agents, milk processors, distributors, vendors, input suppliers/manufacturers, livestock service providers, dairy sector NGOs and public institutions among others

2.1 Dairy Farmers

This is undoubtedly the most important category of dairy industry player. According to the 2008 national livestock census, 1.663 million households keep cattle. The average size of a household in Uganda is 6.9 persons. About a quarter of the households that own livestock (26.5%) were female headed and about a quarter of the households that own livestock (24.5%) were headed by persons under the age of 30 years. According to the 2008 national livestock census report, use of family labour for livestock rearing in Uganda was almost universal. Overall 99.1% of the livestock owning households use family labour as the main source of labour for livestock rearing. It is the women and youth that are major source of family labour. It is therefore concluded that women and youth are very important players in Uganda's dairy industry.

2.2 Dairy Cooperatives and Associations

The Dairy Development Authority in collaboration with Non-Government Organisations (NGOs) continues to support and facilitate formation and registration of member-based organisations of dairy stakeholders from the grass-root to national level. There are many organisations of dairy farmers, milk traders and processors in different parts of the country. Dairy producers are organized into self help groups, associations and cooperative societies at grass-root level. The associations and self help groups are registered by their respective sub-county and district local governments. There total number is not well known.

At national level, dairy farmers are organised under the Uganda National Dairy Farmers' Association (UNDFA) that was formed on 19th October 2001 with support from Dairy Development Authority and Land O' Lakes and registered on 18th January 2002 under the Companies Act (Cap 85 of the Laws of Uganda) as a company limited by Guarantee and not having a share capital. UNDFA mobilized and recruited 160 members including dairy farmers' associations, co-operative societies, dairy marketing companies and individual dairy farmers. Majority of the members were recruited from the south western region. Currently, the association is not active. The major challenge it is facing is sustainable financing of its activities.

2.2.1 Milk producer cooperatives

Cooperative societies are registered by the Registrar of Cooperatives at the Ministry of Tourism Trade and Industry (MTTI). A recent study funded by FAO showed that there were 367 registered primary cooperative societies of dairy farmers in the different regions of Uganda. Only 214 primary cooperative societies were still active. Majority, 128 (60%) of the active societies were found in the south western region followed by central region with 54 (25%). The eastern region had 13 (6%), northern region 10 (5%), and mid-western region 9 (4%). Karamoja region did not have any active livestock/ dairy cooperative society. A total of 153 cooperative societies were dormant. Majority of these, 69 (45%) were found in the south western region followed by central region with 46 (30%).

Primary cooperatives are organised into district level cooperative unions and the latter are brought together under the regional/national dairy cooperative unions. Table 2 shows the registered dairy cooperative unions in Uganda.

Table 2: Registered dairy cooperative unions

	Name of Coop	District (S)	Region
1	Ankole Dairy Producers Coop. Union Ltd	Kiruhura	South west
2	Babyakigezi Dairy Farmers Coop. Union Ltd.	Kabale	South west
3	Bushenyi Dairy Industry Coop. Union Ltd.	Bushenyi	South west
4	Central Uganda Dairy Cooperative Union Ltd	Central region	Central
5	Inka Dairy Coop Union Limited	Ibanda	South west
6	Kazo Dairy Farmers Coop. Union Ltd	Kiruhura	South west
7	Mbarara Dairy Farmers Coop. Union	Mbarara	South west
8	Ntungamo Dairy Farmers Coop. Union Ltd	Ntungamo	South west
9	Rukungiri Dairy Farmers Co-Operative Union Ltd	Rukungiri	South west
10	Sheema Dairy Farmers Co-Operative Marketing Enterprise Ltd	Bushenyi	South west
11	Uganda Crane Creameries Cooperative Union	Mbarara	South west

The south western region has 9 district cooperative unions and one (1) regional union for dairy farmers. The central region has one regional union. The other four regions, namely eastern, northern, mid western and Karamoja do not have any registered union but have a small number of primary cooperative societies.

2.2.2 Dairy processors' and traders' associations

Uganda Dairy Processors' Association **(**UDPA) is the national association of dairy processors. UDPA was established in 2003 with the assistance of Land O' Lakes and Dairy Development Authority. The Association was registered under the Companies Act (Cap 85) as a company limited by guarantee and not having a share capital. UDPA mobilised and recruited 38 members, which include large dairy processing companies, SMEs involved in milk processing and marketing as well as organisations of dairy farmers and milk traders. Some of the members ceased to operate while new members were recruited. Currently, UDPA has 32 members of which only ten (10) are active, attending general meetings and paying the annual subscription fees. Table 3 shows the complete list of members of UDPA.

Table 3: Members of Uganda Dairy Processors' Association

No.	Name of Member	Location	Type of Member	Category of Fees	Status
1	Jesa Farm Dairy	Busunju	Large Processor	1*	Active
2	Sameer Agriculture and Livestock	Kampala	Large Processor	1	Active
3	Fido Dido	Kampala	SME	1	Active
4	Gouda Gold	Kampala	SME	1	Active
5	UCCCU	Mbarara	Cooperative Union	1	Active
6	On Farm Dairy Enterprise	Kampala	SME	1	Active
7	Creamland Dairies	Kampala	SME	2**	Active
8	Family Choice Ltd	Mbarara	SME	2	Active
9	Impact Processors (Soroti Dairy)	Soroti	SME	2	Active
10	GBK Dairy Products (U) Ltd	Mbarara	Large Processor	1	Not active
11	Snowman Group	Kampala	SME	1	Not active
12	White Nile Dairies	Jinja	SME	1	Not active
13	Paramount Dairies	Mbarara	SME	1	Not active
14	Birunga Dairy	Kisoro	Large Processor	1	Not active
15	Shumuk Dairy	Mbarara	Large Processor	1	Not active
16	MADDO Dairies	Masaka	SME	1	Not active
17	Karo Karungi Dairy Farm	Kampala	SME (Milk Trader)	2	Active
18	Tweyambe	Kampala	SME (Milk Trader)	2	Not active
19	Cream Masters	Entebbe	SME	2	Active
20	Season's Dairy	Bbaale	SME	2	Not active
21	Country Fresh	Kampala	SME	2	Not active
22	Bio Dairy	Kampala	SME	2	Not active
23	Gulu Women Farmers	Gulu	Farmer Cooperative	2	Not active
24	Summer Dairy products	Kampala	SME	2	Not active
25	Kisubi United Dairy	Kampala	Farmer Cooperative	2	Not active
26	Yoghurt Plus	Mbarara	SME	2	Not active
27	KMF Products Ltd	Kampala	SME	2	Not active
28	Classic Dairy	Mbarara	SME	2	Not active
29	Mbarara Dairy	Kampala	SME (Milk Trader)	2	Not active
30	Awamu Dairy	Kampala	SME (Milk Trader)	2	Not active
31	Kashari Buhweju Farmers	Mbarara	Farmer Cooperative	2	Not active

**1 = Pays annual subscription of UGX 300,000; **2= Pay annual subscription of UGX 100,000*

Milk traders in Uganda are organised together under the Uganda National Dairy Traders Association (UNDATA) that was established in 1999 with support from the Uganda National Chamber of Commerce. Members of UNDATA include individuals and organisations engaged in the trade in milk and dairy products such as transporters, small-scale processors, cooler operators, farmers and vendors. The Association was registered on 23rd November 1999 under the Companies Act (Cap 110) as a Company Limited by Guarantee and not having a share capital. The mission of UNDATA is "to promote, maintain and further improve the

collection, transportation and marketing of quality milk and milk products in Uganda and beyond through the operation and management of dairy trade and business".

Through their association, milk traders are able to collectively tackle constraints and challenges in their milk marketing business. They have successfully lobbied government to review policies meant to outlaw the sale of raw milk in urban centres. Their urban milk sales outlets and the rural milk collection centres are registered and regularly inspected by Officials of Dairy Development Authority to ensure compliance with the set guidelines for milk handling premises. Their milk handling workers undergo regular medical examination and have been trained by DDA on milk quality and handling, customer care and record keeping. The traders pay annual registration fees for each of the milk collection centres and retail sales outlets. Their road tankers are regularly inspected and certified by DDA.

2.3 Dairy Sector Non-Government Organizations (NGOs)

Many local and International NGOs as well as International development agencies have continued to play a key role in development of Uganda's livestock sector. Key areas of intervention cover the entire dairy value chain and include among others support to increase milk production and productivity, improve access to business development services, farm management, milk processing, market access and development, co-operative development, agri-business management, livestock genetic improvement, disease control, access to credit services, range management, water harvesting technologies, renewable energy (especially biogas) and natural resource management. Some of the prominent local and international dairy sector NGOs include Heifer International, Send-A-Cow Uganda, Land O' Lakes, TechnoServe, World Wide Sires Inc, World Vision, SNV, Veterinaras San Fronteras, Lutheran World Federation, Agency for Co-Operation and Research in Development (ACORD), OXFAM, World Vision, Christian Vet Mission, Concern, ICRAF, African Breeders Service, Child Fund International, Church of Uganda, Uganda Catholic Secretariat, CARITUS Uganda, AFRICARE, KULIKA, Rotary International, Uganda Red Cross, YWCA, Action Aid, and Food for Hungry, Africa2000 Network, Uganda Red Cross Society, Baptist Church. The major international development agencies (partners) include DANIDA, USAID, French Development Agency, AVSI, French Embassy, USDA, Bothar Ireland, IFAD, ADB, GTZ, EU,EEC, ODA, IDA, AU/IBAR, as well as UN Agencies such as FAO, WFP, UNDP and the World Bank.

i) Heifer International

Heifer International is a Non-Government Organization founded in 1944 in the United States of America. Heifer International (HI) has been working in Uganda since 1982 assisting resource poor households to work towards ending hunger, poverty and to care for the environment. The main activities of HI include livestock placement and health care, training and education, enterprise development, livestock services and environmental management. HI is well known for providing dairy cows (in-calf heifers) to resource poor households, particularly women and popularizing the zero grazing system of management. The Beneficiaries later pass on one female offspring to another beneficiary in their group, a concept referred to as Passing-On- a- Gift.

Between 1986 and 2007, over 15,000, households directly benefited from HI support through placement of various livestock species including dairy cattle, dairy goats, oxen for

animal traction, pigs, indigenous goats for cross breeding, imported pure Boer goats, and bee-hives, while over 1.5 million families indirectly benefited from HI intervention to increase household income, improve nutrition and sustainable environmental management. HI made significant contribution to the national dairy herd through importation of dairy breeding stock from USA, Ireland and Germany until 1995. HI also imports quality dairy cattle semen from USA and Ireland and contributes to training and equipping of Artificial Insemination technicians. As part of the sustainable environment management, HI promotes a number of agro-ecological practices such as tree planting, and use of animal manure and urine to improve soil fertility. HI also promotes the construction of biogas plants and use of biogas for domestic cooking and lighting as well as construction and use of energy saving stoves.

Heifer International is also implementing the **East Africa Dairy development Project (EADD)** in partnership with TechnoServe Inc.; International Livestock Research Institute (ILRI), World Agro-Forestry Centre and African Breeders Service. The project which is funded by Bill and Melinda Gates Foundation through a grant of US$ 42.8 million is supporting and facilitating the mobilization of dairy farmers in the central region to form Dairy Farmer Business Associations. The project supports the beneficiary DFBAs through training, organizational capacity building, commercial enterprise development (setting up milk chilling plants, feed mills, agro-vet shops,) creation of hubs of business development services (animal health, artificial insemination, input shops, finance, training, milk transport, feeds), domestic and regional exchange visits, as well as market development and access. The vision of success for EADD is to transform the lives of 45,000 families in Uganda by doubling their household dairy income through integrated interventions in dairy production, market access and knowledge application by the year 2018.

EADD is currently working with 31 Dairy Farmer Business Association (DFBA) within the central region of Uganda. Each DFBA is constituted by a varying number (usually 1-8) producer Cooperatives/ associations with membership of up to 1500 smallholder farmers. Each DFBA is made of numerous (up to 50) small groups called Dairy Interest Groups (DIGs) at a lower level (usually at Parish level). Each DIG has 30 or more members. Most interventions of EADD are implemented at the DIG level

ii) TechnoServe Inc./ Uganda

TechnoServe is an International non-profit economic development organization founded in the USA. TechnoServe helps entrepreneurial men and women in poor rural areas of the developing world to build businesses that create income, opportunity and economic growth for their families, their communities and their countries. In Uganda, TechnoServe work in the dairy sector started with implementation of East Africa Dairy Development Project in 2008. TechnoServe also supports dairy development activities alongside the banana value chain development project in south western Uganda

iii) Land O' Lakes Inc (LOL)

Land O' Lakes, is a US based not-for-profit organization. LOL signed a cooperative agreement with the USAID to implement a three-year USAID funded project, the Cooperative Program Support Project (CPSP). The purpose of the CPSP was to promote sustainable economic development through the creation and/or strengthening of democratic grass-root

cooperatives in developing and transitional economies which provide a means for people to increase their incomes, productivity, and human dignity. This would also strengthen Land O' Lakes' role as a cooperative development organisation. Land O'Lakes' first private sector dairy development program in Africa began in Uganda in 1994 as an eighteen-month program. The private sector-based dairy development program provided technical assistance at all levels of the dairy value chain. LOL provided training in cooperative development, association formation and building, milk production and dairy product development, processing and marketing, as well as agribusiness management. Between 1994 and 2009, LOL implemented several Dairy Development projects funded by USAID and USDA. For a period of three years, from 1st October 2001 to 30th September 2004, a consortium of three dairy sector NGOs namely Land O' Lakes, Heifer Project International and World Wide Sires implemented the Uganda Private Sector Dairy Industry Development Activity funded by the United State Agency for International Development (USAID) to a tune of US$ 5.8 million. The USDA-funded Uganda Food for Progress program implemented later put a lot of emphasis on forming of cooperatives, collective milk bulking and marketing and looking at dairy farming as a business.

iv) Send A Cow Uganda

Send-A-Cow Uganda (SACU) is one of the major dairy sector NGOs that has significantly contributed to the development of Uganda's dairy industry. SACU has been providing dairy animals to poor households (particularly to women) since 1988 when it was founded in response to a plea from a Ugandan Bishop to Christian Communities in the UK. SACU continues to support numerous farmer groups through training, animal placement and livestock breeding. Most of the beneficiary groups are in Mukono, Mpigi and Mityana districts where SACU started its development activities. Currently SACU is implementing three programmes in Uganda, one in the eastern, central and northern regions. The core of each of the three programmes is similar. All beneficiaries get training in group work and organic farming. They receive livestock, mainly dairy cows or goats.

v) DANIDA Support to the dairy sector and DDA

The Danish International Development Agency (DANIDA) is one of the development partners that have made tremendous contribution towards rehabilitation and development of Uganda's dairy industry. Some of the projects supported by DANIDA include Rehabilitation of Dairy Corporation & Mbarara Milk Collection Centres, Dairy Master Plan Study, Immunisation against ECF, Agricultural Sector Programme Support (ASPS I & II) , and Toro Dairy Co-operative Society mini-dairy plant, agri-business development financing, study on smallholder dairying in Uganda and many others.

Under the Agricultural Sector Programme Support (ASPS II) of DANIDA, Dairy Development Authority received financial support to implement dairy sector regulations between 2004 and 2007. A total sum of Uganda Shillings 780.564 million approximately (US$ 433,000) was provided through the Ministry of Agriculture, Animal Industry and Fisheries for purchase of equipment for the milk quality laboratory, vehicles and office equipment and for implementing field regulatory activities.

vi) French Dairy Project (ACSS)

Agricultural Consultation and Sector Structuring Project (ACSS) was funded by Agence Française de Développement (French Development Agency) through the Priority Solidarity Fund (PSF) between 2003 and 2008. The total cost of the project was 2 million Euros including the cost of foreign technical assistance and the contribution from government of Uganda. The Priority Solidarity Fund contribution amounted to Euros 1.19 million. The objective of the project was to support implementation of the Plan for Modernization of Agriculture, by contributing to the process of strengthening the participation of farmer organizations at local and national level, in economic activities and in agricultural policy design, by drawing experience from activities implemented in a the dairy sector and the South western region. From July 2005 to December 2007, Dairy Development Authority was responsible for implementing the project.

ACSS provided a lot of support to farmer organizations in south western Uganda (Mbarara, Kiruhura, Ibanda, Bushenyi, Ntungamo and Isingiro), promoting the formation and registration of dairy cooperative societies, and providing grants for setting up infrastructure for milk bulking and collective marketing, training, exchange visits, as well as strengthening producer cooperatives through promotion of good governance, transparency and financial accountability.

At national level, DDA/ACSS project provided financial support to Uganda National Dairy farmers' Association (UNFA), Uganda Dairy Processors' Association (UDPA) and Uganda National Dairy Traders' Association (UNDATA). With ACSS support, UNDFA was able to set up a secretariat to coordinate all activities of the association in the different regions and to register Uganda Crane Creameries Cooperative Union Ltd (UCCCU) as business arm of UNDFA.

2.4 Input Manufacturers/Suppliers

Business Development Services remain a key aspect of the dairy sector development process. Among the key service providers are manufacturers or suppliers of inputs at various levels of the dairy value chain. Among the key inputs are farm machinery and equipment, veterinary drugs, chemicals and biological (hormones and vaccines), genetics and related supplies, milk processing equipment and additives, animal feeds, pasture seeds, milk handling and transport equipment. The dairy industry thrives on many categories of services. Among the key services are animal health, breeding/ artificial breeding, finance, and training/education among others. Table 4 is a list of some of the key business development service providers in Uganda.

Table 4: List of key input suppliers

No	Name of firm	Category of product/ service
1	Engano Millers	Animal feeds
2	UNGA	Mineral supplements
3	Maganjo Grain Millers	Animal feeds
4	Ugachick Poultry Breeders	Animal feeds
5	Bulemezi Farm Enterprises	Animal feeds
6	Uganda Feeds Ltd	Animal feeds
7	BOKOMO U Ltd	Animal feeds
8	Formula Feeds	Animal feeds
9	Coopers (U) Ltd	Veterinary drugs, chemicals, biological and equipment
10	Quality Chemicals	Veterinary drugs, chemicals, biological and equipment
11	Norbrook (U) Ltd	Veterinary drugs, chemicals, biological and equipment
12	ERAM	Veterinary drugs, chemicals, biological and equipment
13	Victoria Seeds	Pasture seeds
14	Elgon Seed Co	Pasture seeds
15	BRAZAFRIC	Equipment (Feed processing)
16	SNOWMAN GROUP	Dairy equipment, dairy processing additives
17	PROMACO Ltd	Dairy equipment, dairy processing additives
18	World Wide Sires	Artificial breeding supplies
19	African Breeders Service	Artificial breeding supplies

Chapter 3

3. POLICY AND REGULATORY ENVIRONMENT

3.1 Dairy Sector Policy and Legal Framework

After completion of the first phase of rehabilitation the dairy industry in 1992, Government adopted a whole dairy sector approach as opposed to interventions in limited areas. A complete review of the official dairy sector policy was undertaken through a comprehensive dairy sector Master Plan study. The findings and recommendations of the Dairy Master Pan study together with lessons learned during implementation of the UNDP/FAO dairy project formed the basis for a comprehensive dairy sector policy published in 1992.

The official policy, besides endorsing the UNDP/FAO Project model on producer marketing groups, clearly emphasised the role dairy producer groups would play in development of the sector. The second area of emphasis concerns the provision of support services to dairy farmers. Government support services would be rehabilitated and concentrated in milk-sheds selected on the basis of comparative advantage. Where the service benefited the dairy sector and the nation in general, government would fund the service. Where the service directly benefited individual farmers or farmer groups and where the latter would be willing and able to pay for the service such as artificial insemination, the users would incur the cost of service. Veterinary services would be privatised. With regard to research, the policy clearly stated that research would address practical problems faced by dairy farmers in Uganda and research priorities would be established in close collaboration with the farmers.

The new dairy sector policy also recommended the establishment of a Dairy Board to regulate, co-ordinate and promote development of the dairy sector. Farmers would be strongly represented on the Board. The policy also introduced a unified agricultural extension service. Key aspects of the official dairy sector policy are contained in the Dairy Master Plan that was adopted by government in 1993.

3.2 The Dairy Master Plan (1993)

The Dairy Master Plan made a number of recommendations aimed at reviving the dairy sector. Some of the key recommendations include:

i) Liberalisation of the dairy industry
ii) Restructuring of the government owned dairy processing company, Dairy Corporation into a commercial company that would be privatized later.
iii) Establishment of a Dairy Board to assume the development and regulatory functions of Dairy Corporation.

Indeed, government liberalized the dairy industry in 1993 and five years later, Parliament enacted the Dairy Industry Act, 1998, which provided the legal framework for establishing a new statutory body, Dairy Development Authority to regulate the liberalised dairy industry.

The Act also provided for restructuring of the government owned Dairy Corporation into a commercial company; Dairy Corporation Limited (DCL) initially owned 100% by government but would be privatised later.
The Dairy Master Plan (1993) has continued to provide the key guidelines for transforming the dairy sector within the framework of a number of other broader government policies such as decentralisation, privatisation, and trade liberalisation. The above three recommendations of the Dairy Master Plan namely liberalisation of the dairy industry, establishment of a regulatory body as well as restructuring and privatisation of Dairy Corporation were implemented fully.

3.3 Dairy Industry Act, 1998

The **Dairy Industry Act, 1998**, provides the legal framework for implementing the key recommendations of the Dairy Master Plan. The Act established Dairy Development Authority (DDA) as a semi-autonomous, statutory body to oversee the development and regulation of the dairy industry. The Act also provided the legal framework for restructuring of the government owned Dairy Corporation into a commercial company; Dairy Corporation Limited (DCL) initially owned 100% by government but would be privatised later. Privatisation was completed in 2006 when a new private operator, Sameer Agriculture and Livestock Ltd took over full control and management of the company asset.

3.4 Important Livestock Sub-sector Policies

3.4.1 Policy on marketing of livestock and livestock products

Some of the major challenges to livestock development are related to the nature of marketing and marketing infrastructure. Limited market opportunities, lack of storage and agro-processing facilities are key constraints in the marketing of agricultural produce. To improve farmer access to local and international markets, there was need to formulate an appropriate marketing policy. This had been identified as one of the priority areas for intervention under the Plan for Modernisation of Agriculture (PMA). A committee was constituted to develop strategies for marketing and processing of agricultural produce.

3.4.2 Animal health policies

Following implementation of the broader national policies such as trade liberalisation, privatisation, and decentralisation, it was necessary to revisit policies and Acts related to the control of livestock diseases and delivery of veterinary services. Accordingly, the following policies were formulated:

- Policy on delivery of veterinary services
- National Veterinary Drug Policy

In order to support the implementation of the above policies, the following Acts were also reviewed/ formulated: Veterinary and Para-Veterinary Bill, Animal Diseases Act, The Animal (Prevention of Cruelty) Act and the Cattle Traders Act

Government was responsible for delivering animal health and veterinary services for a long time. However, in 1984, government stopped importing and distributing subsidised veterinary drugs and chemicals to farmers. Currently, government only imports certain veterinary products for use in control programs for particular diseases such as Foot and Mouth Disease, Contagious Bovine Pleural Pneumonia and vectors such tsetse flies. Importation of veterinary drugs and chemicals is now the responsibility of the private sector. Government role is mainly regulation. Government has also been providing veterinary advisory services to farmers by employing veterinary extension workers at local government level. Since 1994, government has been encouraging veterinarians to leave public service and set up private veterinary practices by providing loans with support from the European Union through the Pan African Rinderpest Campaign (PARC) now Pan African Control of Epizootics (PACE) Project.

3.4.3 Animal Breeding Policy

Until the late 1990s, delivery of Artificial Insemination/ animal breeding services was the sole responsibility of government through the Animal Breeding Centre in the Ministry of Agriculture, Animal Industry and Fisheries. Government implemented a new animal breeding policy, which provides for a number of reforms in the provision of AI and animal breeding services.

Under the new animal breeding policy, government allowed private sector operators to import semen and AI equipment and to administer field AI services. The Animal Breeding Centre was transformed into a **National Animal Genetic Resources Centre and Data Bank (NAGRC)** by an Act of parliament. The new mandate of the centre is to promote, regulate and control as well as, import, export and market animal genetic material, including quality assurance. The organisation is responsible for overseeing a transition from public delivery of AI services to commercial private sector led delivery.

3.4.1 The National Animal Feeds Policy

In 2005, Government developed the National Animal Feeds Policy which aims at stimulating increased feed production, ensuring quality of animal feeds on the market, reducing production costs and building capacity among private and public sector players for the purpose of developing the animal feeds industry. The policy provides the institutional framework to guide and regulate the feeds industry. The Ministry of Agriculture is the key central government institution responsible for coordination of the animal feeds policy. Its overall responsibility is policy formulation, setting standards, quality control and monitoring.

3.5 Broad National Development Policy Framework

i) Poverty Eradication Action Plan (PEAP)

Poverty in Uganda is mainly a rural phenomenon, with 48% of the population living in absolute poverty compared to 16% of the urban population. Poverty eradication is a fundamental objective in the government's strategy for rural development. The Government resolved to reduce the proportion of the population living in absolute poverty from the level of 44% in 1997 to below 10% by the year 2017 (PEAP, 2000). The Poverty

Eradication Action Plan (PEAP) is Uganda's comprehensive development framework, which guides the formulation of government policies. Under this plan, Uganda is to be transformed into a modern economy and modernisation of agriculture is central in the process of transformation.

ii) Plan for Modernisation of Agriculture (PMA)

The government's vision for rural development is embraced in the Plan for Modernisation of Agriculture (PMA) which is a holistic, strategic and operational framework for eradicating poverty through multi-sectoral interventions enabling the transformation of the livelihood of the majority of subsistence farmers in Uganda (PMA, 2000). The main objectives for PMA include:

- Increasing household incomes and improving the quality of life of the poor subsistence farmers through increased agricultural productivity and access to markets
- Improving household food security,
- Providing gainful employment and
- Promoting sustainable use and management of natural resources

iii) The National Agricultural Research Policy

The National Agricultural Research Policy aims at focusing research services to address in a sustainable manner, the needs and opportunities of the poor in a market driven environment. The National Agricultural Research Policy promotes the delivery of high quality and efficient agricultural research services by enhancing the participation and co-ordination of the public as well as private service providers. The National Agricultural Research Organisation (NARO) is responsible for implementing this policy.

The National Agricultural Research Policy, 2003 provides for decentralisation of agricultural research services, promoting participation of private sector, civil society and farmers; separating public funding from research services deliver**;** mainstreaming gender issues and concerns, social, human and environmental concerns, quality assurance of agricultural research services, as well as responding to market opportunities

iv) National Agricultural Advisory Services (NAADS)

Under the National Agricultural Advisory Services Policy, government established a decentralised, farmer-owned, demand driven and private sector-led agricultural advisory service delivery system. Farmers working in-groups identify priority enterprises and are assisted by local governments to contract competent private sector service providers to deliver the relevant inputs or services. The policy requires government extension workers to retire from the permanent and pensionable public service jobs in order to take up new positions with NAADS on short term contracts. During the current phase of transition from the traditional agricultural extension system, the central government provides all the funds to pay for the services and inputs. In future, however, farmers will demand and pay for all the services and inputs they require.

v) Policy to promote strategic exports

The government Uganda is implementing a program referred to as “Strategic Interventions to Promote Export of Selected Commodities". Its purpose is to enable the country to take advantage of new opportunities created by trading arrangements such as African Growth Opportunities Act (AGOA) of the USA, as well as bilateral and multilateral regional arrangements such as COMESA and EAC. Milk is one of the commodities identified as priority commodity/product under this program.

3.6 Dairy Industry Standards and Regulations

Dairy Development Authority is responsible for promoting and monitoring quality in the dairy industry through enforcement of standards and regulations. In liaison with the Uganda National Bureau of Standards (UNBS), the Authority developed new and updated the old standards in the dairy industry. The Authority (DDA) also developed the **"The Dairy (Marketing and Processing of Milk and Milk Products) Regulations, 2003",** Statutory Instruments No. 26 of 2003.

In order to facilitate the enforcement and monitoring of standards and quality along the dairy value chain, DDA registers and inspects all facilities and equipment used to handle, process and market milk and milk products throughout the country. Only operators whose facilities and equipment meet the stipulated minimum standards are given licenses to operate. Registration of new operators is carried out continuously and inspection of facilities and equipment for all operators is carried out on a regular basis.

The Authority also supports and facilitates dairy processing firms and milk traders to implement Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Points (HACCP) and to comply with the requirements for International Standards Organisation (ISO) certification

In order to enhance quality in the dairy chain, DDA, on behalf of government outlawed the use of plastic receptacles/equipment for handling/ transporting milk. Most of the operators in the informal market had been using plastic jerry-cans to transport milk on open pick-up trucks, motorcycles and bicycles. They gradually transformed from jerry-cans to aluminium cans and finally to insulated road tankers. Transport of warm milk by bulk transporters and boiling of milk for sale in the urban centres were outlawed.

The sale of loose unprocessed milk is currently the biggest challenge as far as quality in the dairy value chain is concerned. Traders have been advised to begin selling bulk pasteurised milk. Some of the traders have already acquired the locally fabricated pasteurisers. Others are beginning to set up modern milk pasteurisation facilities. DDA continues to encourage raw milk traders/ whole sellers to invest in modern milk processing and packaging infrastructure.

3.6.1 The Dairy (Marketing and Processing of Milk and Milk Products) Regulations, 2003

The Dairy (Marketing and Processing of Milk and Milk Products) Regulations, 2003 being implemented by DDA focuses on the following issues:

i) Processing of milk or milk products
ii) Marketing of milk or milk products
iii) Operating of a factory in which milk is processed or is intended to be processed
iv) Controlling a store used or intended to be used for storage of milk or milk products
v) The business of transportation of milk or milk products
vi) Dealing in dairy equipment

The regulations stipulate that a person shall not undertake any or all of the above activities unless that person is registered by the Authority and issued with a registration certificate. The document lays down the requirements to be met by applicants intending to process milk, set up a dairy store or premises with a milk cooler or freezer as well as the requirements for registration as a transporter.

3.6.2 Code of hygienic practice for milk and milk products

DDA in collaboration with UNBS developed the **code of hygienic practice for milk and milk products.** The document provides guidelines for hygienic production and handling of milk and milk products at different stages of the dairy value chain. The areas addressed include:

a) Primary milk production: Environmental hygiene, nature of premises, animal care, milking and milk handling equipment, health and hygiene of handlers, hygienic milking practices, collection, storage and transport of raw milk

b) Handling and processing facilities: Location, nature of premises, facilities and equipment, personnel, maintenance and sanitation, pest control and waste management

c) Control of operations: Control of food hazards, hygiene control system, incoming material requirements, processing, packaging, laboratory control, management, supervision, documentation and records, recall procedures, transportation, product information and consumer awareness

d) Sale of milk and milk products: The document lays down provisions/requirements for vending outlets, health and hygiene of vendors, as well as transportation and selling of milk and milk products

3.6.3 Standards for milk and milk products

The Uganda National Bureau of Standards (UNBS) is responsible for setting and enforcing standards of all products and commodities sold on the Ugandan market. UNBS in collaboration with DDA were involved in a number of initiatives to develop new and review existing standards for milk and milk products. Below is a list of the existing dairy standards.

i)	US 8 CS 5:1993	Standard specification for whole milk powder, partly skimmed milk powder and skimmed milk powder
ii)	US 20 CS 1:1993	Standard specification for butter and whey butter
iii)	US 21 CS 11:1993	Standard specification for yoghurt and sweetened yoghurt
iv)	US 22 CS11:1993	Standard specification for flavoured yoghurt and products heat-treated after fermentation
v)	US 33:1993	Standard specification for edible ices and ice mixes
vi)	US 7:1993	Standard specification for labelling of packaged foods
vii)	US 28:1993	Standard specification for factory and employee requirements for food factories

At the East African Community level, EAC Member States have harmonized standards for the following dairy Products: UHT Milk; Yogurt (Sweetened and Flavored); Dried whole milk and skimmed milk powder; Unprocessed whole milk; Pasteurized liquid milk; Dairy milk ices and dairy ice cream; Milk based baby foods; Butter; Milk powders; Condensed milk, among others. In terms of sanitary requirements to control animal disease, it is mandatory in all countries that imports of dairy products be accompanied by Animal Health Certificate issued by a Competent Authority, i.e. agency of Government responsible provisional of Veterinary Services

Some of the key developments in the implementation of the EAC Treaty include the adoption of a single customs entry document. Forty-two (42) standards have been harmonised and adopted as East African Standards. Three of the harmonised Standards deal with milk and milk products.

3.6.4 Other legal instruments governing the sale of milk and milk products

Other important legal instruments governing the sale of milk and milk products include the Public Health (sale of Milk and Milk Products) Rules, and Kampala City (Sale of Milk and Milk Products) Ordinance

3.7 Operating Licenses and Fees

Dairy Development Authority (DDA) requires all individuals and companies intending to undertake dairy related businesses to register and to pay annual registration fees. DDA carries out regular inspection of all facilities used to handle and/or process milk. Table 5 shows the operations that are licensed by DDA and the corresponding annual registration fees.

Table 5: Annual registration fees for different dairy operations

License	Annual Fees (UGX)
Processing milk and milk products (large scale processor)	500,000
Small scale processor	150,000
Dealing in starter culture	200,000
Importers of milk and milk products	2,000,000
Operating milk coolers	75,000
Operating deep freezers	30,000
Controlling a store used or intended to be used for the storage of milk or milk products	150,000
Transporting milk and milk products	200,000
Dealing in dairy equipment	500,000

Note: 1 US$ = 2,408 Uganda shillings (Bank of Uganda Exchange Rate March 31, 2011)

Traders who set up milk vending outlets are required to pay annual trading licence fees to the respective local government. Even milk bulking facilities may be required by the local authorities (Municipal Councils, Town Councils or Sub-counties) to pay fees for the annual trading licence. The fee varies from one area to another and depends on size of the facility. It may be as high as US$ 100 per year or more. Hawkers/ vendors who sell milk in urban areas may be required to pay small daily fees ranging from 200/= (US$ 0.08) to 500/= (US$ 0.20) per day to the local authorities.

CHAPTER 4

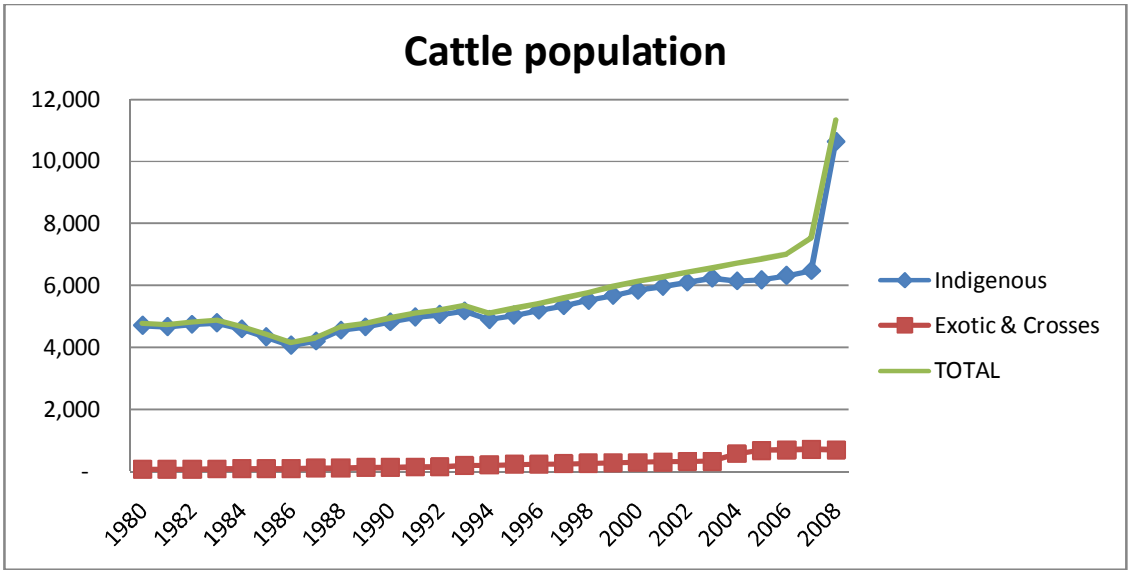
4. CHARACTERIZATION OF THE MILK PRODUCTION SYSTEM

4.1 Cattle Population and distribution

4.1.1 Cattle population

Cattle are the major source of milk in Uganda. The population of dairy goats and other milk animals (buffaloes and camel) is insignificant. The national herd of cattle was estimated at 11.4 million in 2008 and had been growing steadily from approximately 4.2 million head of cattle in 1986 (see Figure 2).

Figure 2: Trend of Uganda's cattle population, 1980–2008



Many factors have been responsible for the steady increase in the cattle population. Cattle restocking initiatives by government and private development organizations/NGOs continue to play a key role in enabling poor households to acquire livestock as a means of improving household income, food and nutrition security, soil fertility and draft power. Under the National Livestock Productivity Improvement Project (NLPIP) funded by the African Development Bank (ADB), the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) has been implementing a re-stocking programme in a number of districts including: Abim, Amolatar, Budaka, Bukedea, Katakwi, Kitgum, Kumi, Kotido, Lira, Moroto, Nakapiripirit, Oyam, Pader, Pallisa, Sironko, and Soroti. The Prime Minister's office has also been implementing several cattle restocking projects in the war ravaged areas of northern, Luwero-Rwenzori and parts of eastern Uganda.

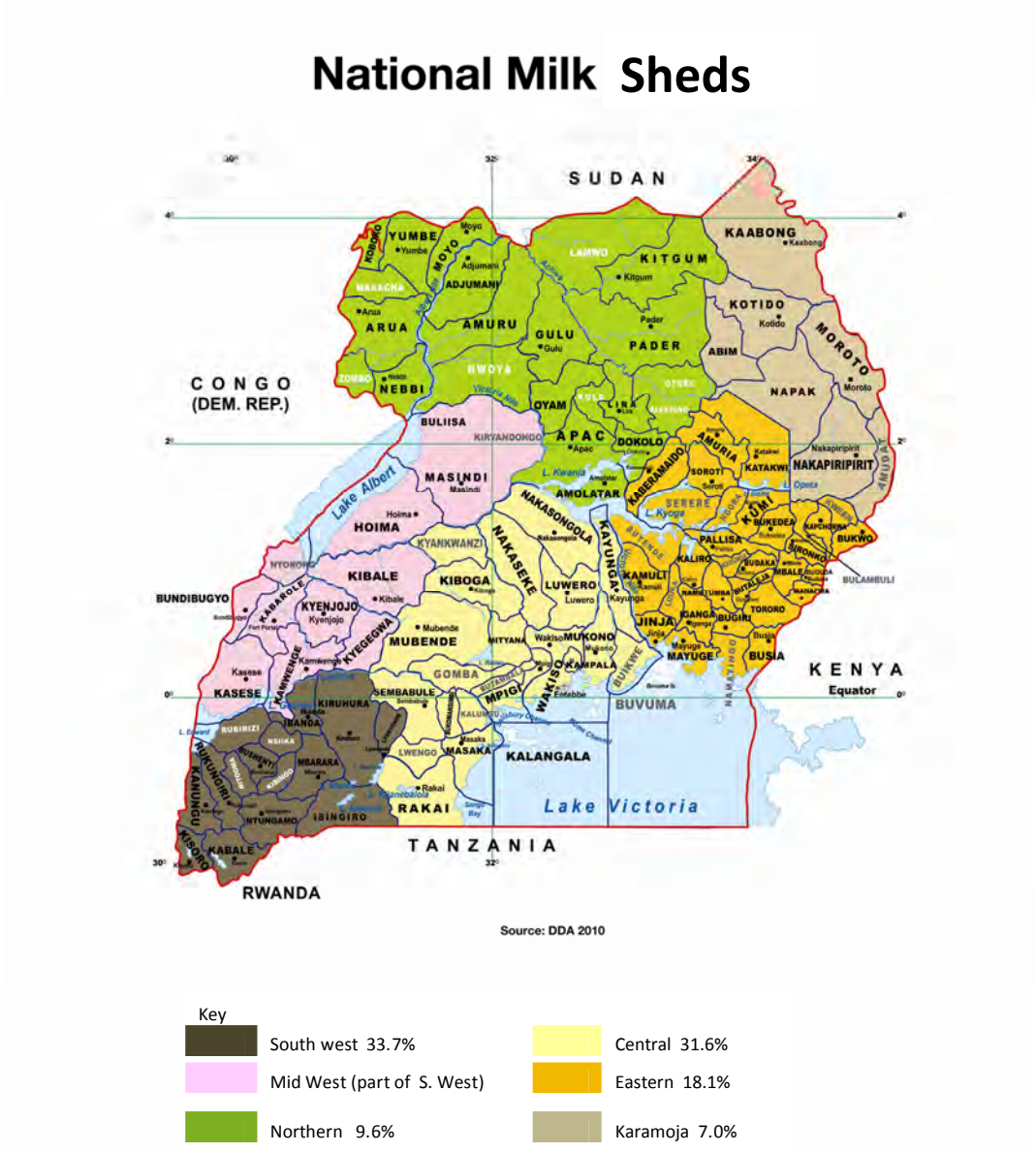
The Ministry of Agriculture (MAAIF) continues to implement various strategies which could be partly responsible for the increase in the number of cattle in the country. These strategies include: implementing disease control programmes; promoting genetic improvement; improving livestock nutrition; improving livestock marketing systems; supporting and guiding the training and delivery of advisory services; improving research in

livestock production; formulating and reviewing supportive policies and legislation; and generating data on livestock.

4.1.2 Uganda's milk sheds (dairy regions)

Uganda is divided into six milk-sheds (dairy regions) based on agro-ecological factors, as well as the milk production and market situation. The six dairy regions exhibit significant differences in terms of milk production potential, cattle numbers, market dynamics and dairy infrastructure among others. Fig. 3 shows the six milk-sheds of Uganda, namely south western, mid-western, central, eastern, Karamoja and northern.

Figure 3: Map of Uganda showing the different milk sheds



The 2008 national livestock census data was analyzed basing on five geographical regions, namely Karamoja, eastern, central, western, and northern. Each geographical region is

equivalent to a milk-shed except the western region which combines two milk-sheds namely south western and mid western. The regions mentioned in the subsequent sections of this document are the geographical regions.

4.1.3 Cattle ownership and distribution

According to the 2008 national livestock census, about 4.5 million households (70.8% of total households in the country) rear at least one kind of livestock or poultry. The estimated number of households keeping cattle is 1.663 million (26.1% of total households). The eastern region has the highest number of households owning cattle (0.630 million). Among the cattle-owning households, the average number of cattle per household was 6.9. The highest average herd size was 20.8 cattle for Karamoja region. Table 6 shows the distribution of cattle owning households by region. Majority (92.7%) of the cattle-owning households keep indigenous cattle.

Table 6: Households (HHs) owning cattle and the mean herd sizes

Region	Cattle Owning Households					
	Number	**% of all HHs**	**% keeping Indigenous**	**% keeping dairy Exotics/ Crosses**	**% keeping beef Exotics/ Crosses**	**Mean herd size**
Central	339,170	18.2%	88.6%	16.1%	1.3%	7.3
Eastern	630,000	39.1%	92.5%	9.1%	1.3%	3.9
Northern	298,040	26.4%	99.6%	0.8%	0.3%	5.5
Western	287,480	18.4%	88.0%	17.9%	0.8%	8.9
Karamoja	108,450	53.6%	100.0%	0.2%	0.6%	20.8
Total	**1,663,140**	**26.1%**	**92.7%**	**10.0%**	**1.0%**	**6.9**

Source: Data from MAAIF/UBOS 2009

Out of the estimated 11.4 million head of cattle in Uganda, 2.515 million (22.3%) were in the Western Region, 2.470 million (21.8%) in the Eastern Region, and 2.396 million (21.7%) in the Central Region. Karamoja region had 2.247 million cattle (19.8%) and the Northern region had 1.637 million cattle (14.4%).

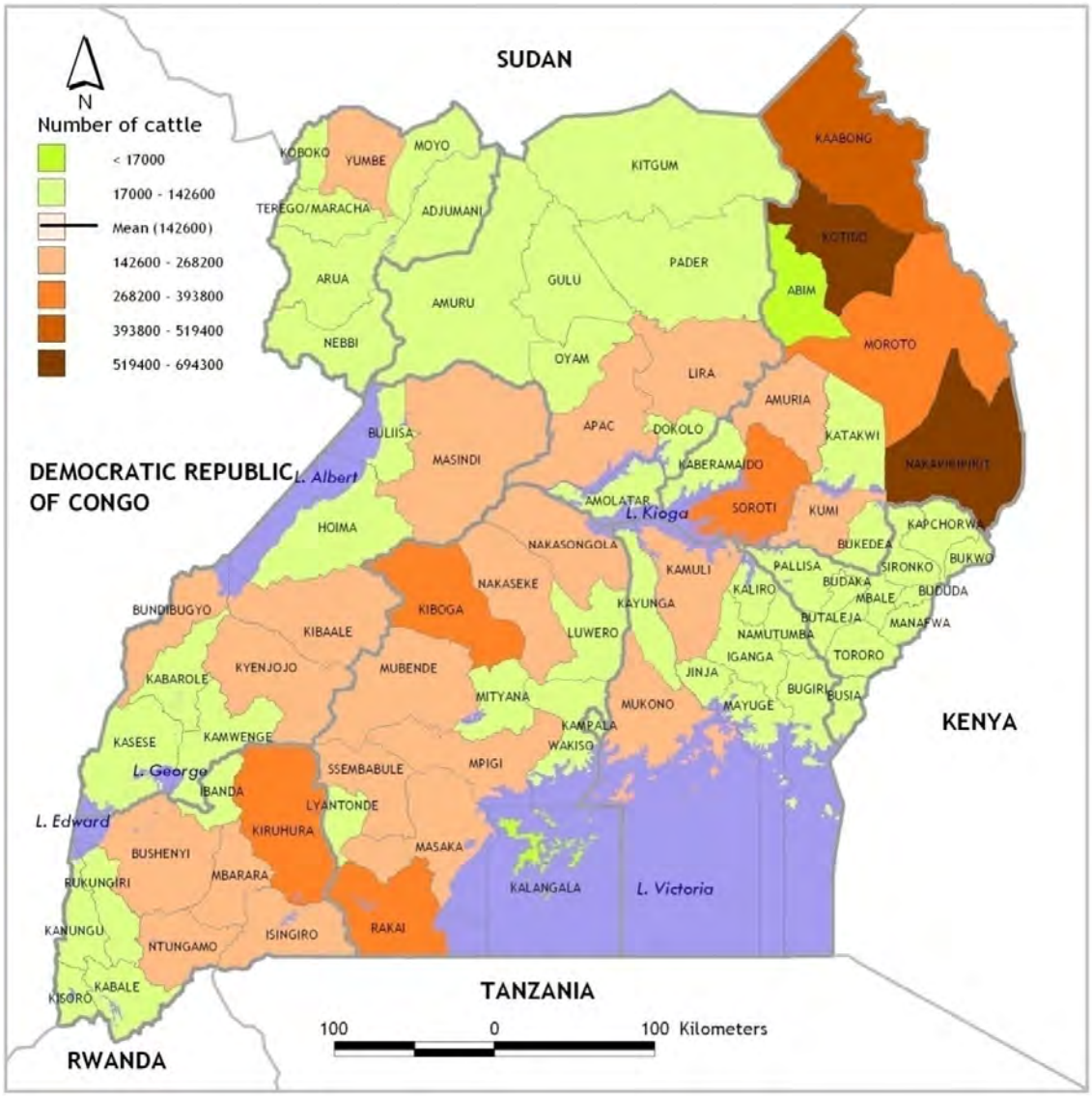
Table 7: Cattle distribution by region

Region	(A) Beef Exotics/ Crosses		(B) Dairy Exotics /Crosses		(C) Indigenous		Total No. of Cattle		Dairy herd (B+C)
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number
Central	34,430	0.3%	187,270	1.7%	2,209,620	19.5%	2,431,320	21.4%	2,396,890
Eastern	16,580	0.1%	125,280	1.1%	2,345,610	20.7%	2,487,470	21.9%	2,470,890
Northern	3,490	0.0%	6,310	0.1%	1,631,030	14.4%	1,640,830	14.5%	1,637,340
Western	14,890	0.1%	302,960	2.7%	2,212,210	19.5%	2,530,060	22.3%	2,515,170
Karamoja	6,060	0.1%	2,760	0.0%	2,245,140	19.8%	2,253,960	19.9%	2,247,900
TOTAL	75,450	0.7%	624,580	5.5%	10,643,610	93.8%	11,343,640	100.0%	11,268,190

Source: Data from MAAIF/UBOS 2009

The difference in herd size between Western, Central, Eastern and Karamoja regions was negligible. Table 7 shows the number of cattle in the five major regions of Uganda. Fig. 4 shows the distribution of cattle by district. Kotido district registered the highest cattle population, numbering 694,250, approximately 6.1% of the national herd.

Figure 4: Total number of cattle by district



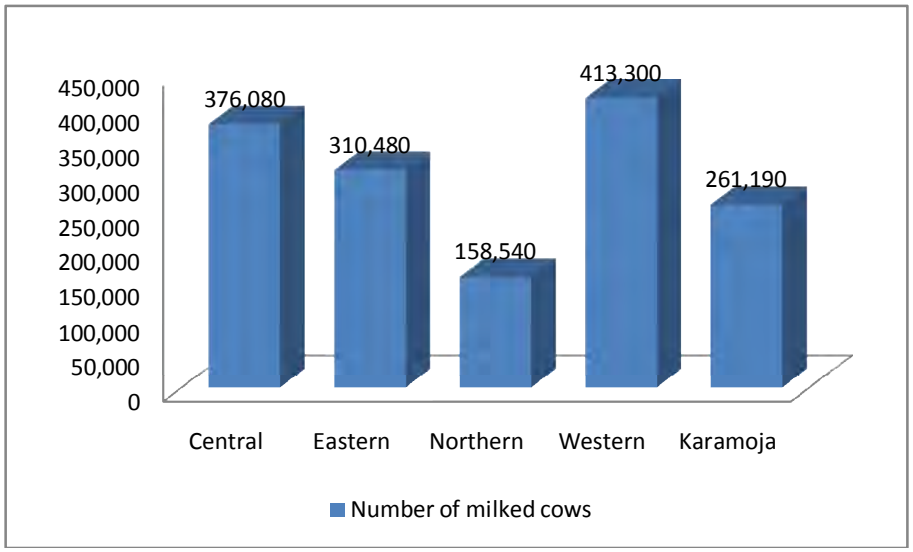
4.2 Milk Production Estimates

4.2.1 Number of milked cows and average milk yield

Figure 5 shows the distribution of milked cows by region. The total number of milked cows was estimated at 1.52 million in 2008. Results of the 2008 national livestock census showed that milked cows comprised 32.8% of all adult cows in Uganda, with the western region

having the highest number of milked cows estimated at 0.41 million. The western region also had the highest proportion of adult cows that are milked (35.6%),

Figure 5: Number of milked cows per region



Source: Data from MAAIF/UBOS 2009

On average, each milked cow produces only 8.5 litres of milk per week. The average yield per cow per week also varies from region to region, the highest being 9.8 litres in the central region closely followed by western (9.7 litres) (see Table 8).

Table 8: Number of milked cows and milk yield per cow per week

Region	Number of milked cows	Milked cows as a % of all adult cows	Average milked yield per milked cow per week	Proportion of milk production sold	Average price (UGX)
Central	376,080	34.2%	9.8	39.1%	428
Eastern	310,480	33.9%	7.3	35.8%	459
Northern	158,540	25.7%	5.2	42.4%	517
Western	413,300	35.6%	9.7	42.7%	355
Karamoja	261,190	31.1%	7.8	6.4%	540
Total	**1,519,590**	32.8%	8.5	34.7%	442

Source: Data from MAAIF/UBOS 2009

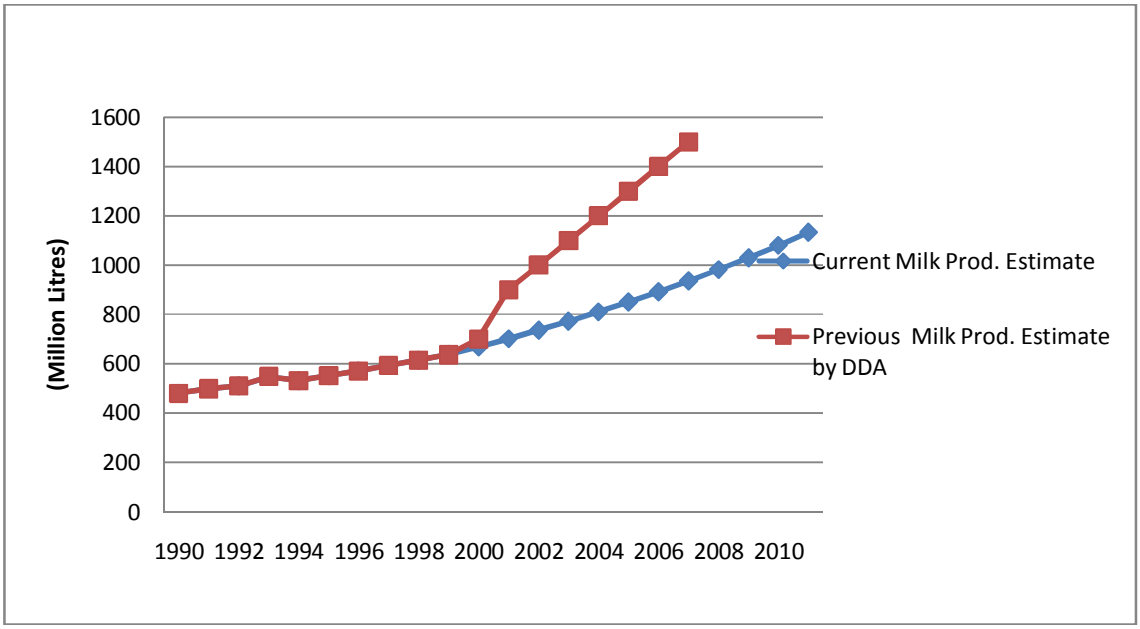
4.2.2 National milk production estimate

The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and Dairy Development (DDA) have been publishing the annual estimates of milk production, marketed milk and per capita milk consumption. The data available indicate that the national milk production has been growing steadily from approximately 395 million litres in 1986 to an estimated 1.5 billion litres in 2007. A critical review of the national milk production statistics since the year 2000 shows that the figures quoted by MAAIF/DDA may be exaggerated. The compound

annual growth rate (CAGR) for the period 2000 to 2007 was 11.28%. The possible reason for the apparently exaggerated estimates could have been lack of up-to-date statistics on cattle numbers and milk production performance.

In this review, the total national milk production for the year 2010 was estimated at 1.08 billion litres with an annual growth rate of 4.9%. Production by exotics and crosses accounted for 30.2% of the national total while indigenous cattle contributed 69.8%. Figure 6 shows the trend of annual milk production from 1990 to 2010 based on the MAAIF/DDA data as well as the revised production estimates based on the 2008 national livestock census data.

Figure 6: Annual national milk production estimate, 1990 to 2010



According to the 2008 national livestock census, it was estimated that Uganda produces about 1.85 million litres of milk per day from a herd of 1.52 milked cows. This would translate into 675 million litres per year. However, this appears to be an underestimate of the national milk production. The 2008 census data show that the average milk yield per cow per week was 9.7 litres in western region and 7.8 litres in Karamoja region.

This means that the average milk yield of cows in the western region was higher than that of cows in Karamoja region by 1.9 litres per week or 0.27 litres per day. It should be noted that the prevailing conditions in western region favour production of much more milk than in Karamoja region. Therefore an average difference of 0.27 litres per milking cow per day may not be accurate considering the following factors:

i) The western region has the largest number of exotics and crosses in Uganda, estimated at 302,960 or 48.5% of all exotics and crosses in the country while Karamoja has only 2,760 or 0.04% of the total. The average milk yield of exotics and crosses is 2-3 times higher than that of indigenous breeds.

ii) The predominant indigenous breed in western region is the Ankole while in Karamoja it is the larger Zebu type known as Karamojong. Previous studies show that the Ankole cow which is generally bigger than the Zebu also produces more milk than the latter. The average difference is at least 0.25-0.50 litres per milking.

iii) The supply and quality of pastures/forgae resources in the western region is much better than in Karamoja region and would favour much higher average milk yields per cow. Most households in the western region have fenced farms, and have significantly invested in pasture improvement and on-farm development of water sources. In Karamoja, most cattle keepers rely on communal grazing grounds which are sometimes overgrazed. Lack of water for livestock is a very common and more serious livestock production constraint in Karamoja region which is generally semi-arid with poorly developed water sources

iv) The average milk yield of 9.7 litres per week or 1.38 litres per day may apply to a population of pure indigenous cattle. However, in the western region where the exotics and crosses constitute over 12% of the dairy herd, the average milk yield would have been much higher than was reported.

In order to arrive at more accurate and credible national milk production estimates, a modified version of the formula previously used in the Dairy Master Plan (MAAIF, 1992) was used. The original formula considers the production of milk by indigenous and improved breeds separately. For each breed category, the parameters considered include total number of animals, proportion of adult, proportion of female adult, proportion of female adult calving, average lactation length, average milk yield per cow per day. The values used in the original formula are determined at national level and for only to breed categories namely exotics/crosses and indigenous:

Total national milk production = Total number of cattle * a * b * c * d * e; where:
a = % Adults over total population
b = % Adult female over total adult population
c = % Adult females calving over female adult population
d = Period of Lactation (days)
e = Average milk yield per cow (litres/day).

As a modification to the original formula, the milk production of Ankole, Zebu/Nganda and exotics/crosses in the different regions were estimated separately, taking into consideration regional intra-breed differences in milk yields and lactation length. The original formula assumes uniform average milk yields and lactation length for a particular breed in all regions. However, regional differences in the production performance of animals of the same breed exist and may be attributed to differences in agro-ecological conditions and management levels, particularly the weather conditions, availability and quality pastures, access to water, and use of concentrate feeds. For example in the central region, a large proportion of farms give concentrate feeds owing to the high farm gate milk price. However, use of concentrate feeds in other regions is minimal. Up-to-date numbers of exotics/crosses, Zebu/Nganda and Ankole cattle used in the modified formula were obtained from the national livestock census report (MAAIF/UBOS 2009).

Table 9 shows the current estimates of milk production for the different regions. The total national milk production estimate for 2010 is 1.08 billion litres and the annual growth rate is 4.9%.

Table 9: National milk production estimate

Region	2010 Annual Milk production (Million Litres)		Total (Million Litres)	Percent of National Total
	Exotics + Crosses	Indigenous		
Central region	125.20	216.69	341.89	31.6%
Eastern region	54.88	140.96	195.84	18.1%
Northern region	2.66	100.98	103.64	9.6%
Western region	143.26	220.80	364.06	33.7%
Karamoja	0.82	74.46	75.28	7.0%
TOTAL	**326.82** (30.2%)	**753.88** (69.8%)	**1,080.70**	100.0%

4.3 Milk production systems

Dairy production systems in Uganda may be classified into two broad categories, namely i) "traditional" milk production systems and ii) "commercial" milk production systems. The traditional production system generally refers to the small scale, farm/household production system closely associated with the informal marketing system. This production system is to a large extent based on small herds of cattle managed mostly by family labour, and few purchased inputs. It is characterized by the multi-objective nature of farmer behaviour, low-input low-output levels and nutrient deficiency at both farm and household level. On the other hand, commercial production systems represent the large scale industrialized production and integrated marketing. This system is generally characterized by larger herds, greater reliance on hired labour and on a greater range of purchased inputs and services. The single objective enterprise nature, high levels of both inputs and outputs and nutrient surpluses at both farm and household levels are salient features of the commercial production system. Unlike the commercial system, the traditional production system shows a huge diversity of forms. The small scale, zero grazing or stall feeding units that are now common in Uganda represent an intermediate system, with features of both traditional and commercial production.

Milk production in Ugandan is dominated by smallholder producers who own over 90% of the national herd. The average herd size is 6.9 per cattle owning household (MAAIF/UBOS 2008). Majority of the producers fall under the traditional production system, characterized by low-input low-output, greater dependence on family labour and keeping cattle primarily for various equally important objectives, including household nutrition, manure for crop production and energy (biogas), store of wealth (saving), ready source of income (sale of animals for beef), social status (based on number of cattle), and daily income from sale of surplus milk. Women and youth play a key role as source of labour for feeding, watering, cleaning, milking and milk marketing in the traditional dairy production systems. On the contrary, women and the youth are to a large extent marginalized in terms of decision making and utilisation of the cash income and other benefits from the dairy enterprise.

Many smallholder farmers generally earn little or no cash income from milk sales yet they never abandon dairying. That can be explained in terms of the importance of other benefits which the household attaches to dairying.

Using the EXTRAPOLATE (EX-ante-Tool-for-RAnking-POLicy-AlTErnatives), a participatory decision support tool designed to help assess, ex-ante, the potential socio-economic impact of policy interventions on different stakeholders, a recent FAO study in Uganda classified the farming systems into seven categories including three intensive and four extensive ones. Using the IFCN methodology, (Otto Garcia, et al, IGAD LPI Working Paper No. 09 – 08) typical dairy farm types in each dairy farming system have been described as follows:

i) Small-holder intensive
This farming system represents the typical zero grazing 1 to 3 graded dairy cows and a total herd of around 2 to 6 animals at any one time. The household owns some land and grows mostly grass (mainly Napier or Pennisetum purpureum) for the dairy and some cash crops. Milk yield per cow reaches 2,500 kg milk per lactation, which is obtained with relatively high use of concentrates. Manure is collected and used as fertilizer. The household income from off-farm sources is significant.

ii) Medium-holder intensive
The average herd size is 15 graded cows but the number may range between 10 and 20 grazing on fenced paddocks. Both lactation yield and use of concentrates per animal are lower than the zero grazing. Although this system has extra costs in fencing and farm maintenance, it shows significant labour and purchased feed cost reductions compared to the smallholder intensive.

iii) Large-scale (commercial) producers
This farm type has high investment in farm infrastructure such as transport vehicle, tractors, buildings, fencing, pasture improvement and highly productive animals. It also uses expensive purchased inputs such as feeds, vet drugs and chemicals, incurs high costs on professional veterinary and breeding services and relies almost entirely on hired labour. This farm is able to capture a relatively high milk prices than other farm types. It is seen as both a lucrative economic activity and attractive investment option for saving off-farm income. Although they exist, large-scale commercial producers are still very few in number owing to the large investment capital requirement. The herd size averages 30 improved cows including pure exotics and crosses. This kind of farm is often set up by people with significant income from other off farm investments.

iv) Small-holder extensive
The household owns a small piece of land, averaging 2 ha but may have access to more land either for rent or communal access. Majority of farms in this category keep about 1-3 indigenous cows, which produce a few litres of milk mainly for home consumption and a little surplus for sale. The household relies on the informal market and may not be enticed to deliver milk to distant rural milk collection facilities owing to the low milk volume produced and marketed per day. No commercial feeds are used, but common salt and rock salt are frequently provided as mineral supplement. The major economic activity if crop production and the farm owner has fewer opportunities for off-farm income.

v) Medium-holder extensive,

The farmer is engaged in other off-farm income generating activities, including formal employment. Family members spend less time on the dairy enterprise. Hired workers (herdsman) graze the animals and carry out other dairy related duties. Animals are grazed on both owned and rented land and sometimes communal grazing grounds. It is common to combine two or more small herds of different households to be grazed by one hired worker. Family members may also graze the combined herds in turns. Herds are only combined at grazing time but separated in the evening. The household pays a lot of attention on the milk produced. Usually the morning milk is sold while the evening milk is consumed by the household and herdsman. The owner prefers to sell milk to a cooperative collection centre but may also sell to rural collectors (agent of raw milk traders). The household lives a completely settled life, investing in reasonable family house, land, and farm equipment and carrying out other economic activities such as keeping a few chicken, goats, pigs and producing enough food crops for home consumption and the surplus for sale. This type of household does not have access to as much land as the pastoralist and agro-pastoralist which limits the herd size to an average of 13 indigenous milking cows. This system is common in areas where there is enough land for both grazing and crop farming and the two activities are undertaken by the household. With time, the available land for grazing gets depleted and the cattle keepers are forced to scale down the herd size. This may be achieved by introducing the more productive improved dairy animals, increased use of crop residues and gradual transition towards intensification and market orientation.

vi) Pastoralist (Semi nomadic pastoralist)

This is a semi-nomadic farm system. Owing to the growing shortage of public communal grazing land, pure nomadic systems are disappearing very fast. Some pastoralists rent private land which allows them to stay in one place for most parts of the year, only relocating to the greener marshes, river banks and lake shores during severe drought. Only the herd is transferred while the rest of the household remains at the rented or purchased land. With time, the originally semi-nomadic pastoralist encounters difficulties in moving the herd to the wet lands during drought as the original cattle routes are cultivated or used for settlement. Such circumstances compel the pastoralist to sell some animals, purchase land and permanently settle in one location. Abandoning transhumance is often accompanied by cultivation of crop food crops at a small scale. The main economic activity of the pastoralist remains livestock farming. Large herds of indigenous cattle, sheep and goats are often kept. Extensive grazing on unimproved natural pastures is the common practice. It is difficult to differentiate between the range land used by a pastoralist and a game reserve. This farming system is common in the relatively drier or semi-arid areas such as the traditional cattle corridor which extends from Ntungamo and Isingiro districts in south western Uganda through central region to Karamoja region in north eastern Uganda. Apart from natural pastures, animals may be supplemented with rock salt placed in wooded canoe-like troughs or spread on anthills. Access to water and pastures of good quality is huge constraint in the dry season. The household may hire a herdsman but it is more common to use family labour for nearly all farm activities. Most of the milk produced is for home consumption and and processing of traditional products with a longer shelf life such as ghee. Only a small surplus is sold to the informal market.

vii) Agro-pastoralist

The farmer's main economic activity is cash crop production (bananas, coffee, pineapples, and other crops with a ready market). Dairying is undertaken because it allows better utilization of the available low-priced land and labour, and produces manure to fertilize the crops. The animals here are a mixture of indigenous and low grade crosses which are managed by extensive grazing on unfenced land. Animals on this farm are slightly more productive than those on the other three extensive farm types, namely smallholder extensive, medium holder extensive and semi-nomadic pastoralist although management and technology levels are basically the same. In addition, this system has crop residues to feed the animals during the dry season. This farm represents the starting point of transformation from traditional to commercial. The farmer earns significant income from crop enterprises and with time finds it easy to fence the land and to increase to number of improved dairy cattle in the herd. At this stage, the herd has an average of 35 local and graded cows. Indigenous cattle are still the majority, constituting more than 60% of the herd. A graded bull is introduced in the beginning but as the farmer gains confidence in management of improved dairy animals and is impressed by the increased milk yields, an exotic dairy breeding bull is introduced at a later stage. As more good quality crosses are born and the milk yields increase, the farmer understands the benefits scaling down the herd size by selling the indigenous breeds and purchasing more improved breeds.

Recent developments in the dairy market following liberalisation of the dairy industry have had a drastic impact on the milk production systems in Uganda characterized by a growing trend towards intensification and market orientation. The increase in the demand for milk particularly in urban areas and the improvement in infrastructure for rural milk bulking and collective marketing are steadily driving production from traditional to commercial in most parts of the country. The move from traditional extensive grazing systems largely dependent on communal resources to private, fenced farms and smallholder intensive units witnessed in the south western and central regions has been hastened by the growing competition for factors of production, particularly land and the desire to maximise economic benefits from dairying owing to the favourable market conditions. Indeed, results of the 2008 national livestock census show that the eastern, central and south western regions have made tremendous advances towards commercialisation of milk production. Out of 1.663 million households (HHs) owning cattle, 165,997 HHs (10%) keep improved dairy breeds. Majority (98.4%) of the HHs keeping improved dairy cattle, equivalent 163,395 HHs are found in the eastern, central and south western regions (Table 10). These regions have ripped the greatest benefits from liberalisation of the dairy industry and the recent improvement in the infrastructure for milk collection and processing.

Table 10: Households keeping improved dairy cattle in the different regions

Region	Total No. of households (HHs)	No. of HHs owning cattle	No. of HHs keeping dairy Exotics/ Crosses	% of HHs keeping dairy Exotics/ Crosses	No. of dairy exotics + crosses
Central	1,863,571	339,170	54,606	16.10%	187,270
Eastern	1,611,253	630,000	57,330	9.10%	125,280
Northern	1,128,939	298,040	2,384	0.80%	6,310
Western	1,562,391	287,480	51,459	17.90%	302,960
Karamoja	202,332	108,450	217	0.20%	2,760
Total	**6,368,487**	**1,663,140**	**165,997**	**10.00%**	**624,580**

Source: MAAIF/UBOS 2009

4.4 Dairy cattle breeding

Efforts to systematically upgrade the genetic potential of the national herd for milk production started in 1953 when crossbreeding of indigenous cattle with temperate dairy breeds was initiated. In 1960, government established the Animal Breeding Centre to coordinate the administration of field artificial insemination (AI) services. The centre also collected and processed semen from selected indigenous bulls and genetically proven exotic bulls and had the responsibility of importing semen and AI equipment, training of AI technicians and producing nitrogen. Numerous field AI stations were also set up in different parts of the country. The immediate objective of crossbreeding indigenous cattle with temperate breeds was to increase milk yields. However, no comprehensive national breeding program was designed to produce animals that were well adapted to the local climatic and disease conditions. As a result, the low productivity and high mortality rate of improved dairy cattle are still a major challenge to commercialization of dairy farming.

Until the late 1990s, delivery of Artificial Insemination/ animal breeding services was the sole responsibility of government through the Animal Breeding Centre under the Ministry of Agriculture, Animal Industry and Fisheries. Under the new animal breeding policy, government allowed the private sector to import semen and AI equipment and to provide field AI services. The Animal Breeding Centre was transformed into a National Animal Genetic Resources Centre and Data Bank (NAGRC) by an Act of parliament. The new mandate of the centre is to promote, regulate and control as well as, import, export and market animal genetic material, including quality assurance. Currently, there are several private companies and NGOS that import breeding materials and provide private AI services. The major ones include World Wide Sires, Heifer International, African Breeders Service, Send A Cow Uganda and BRAC.

Despite privatisation of AI services, adoption of the technology particularly for improving the genetic potential of indigenous breeds under traditional extensive management systems has remained low because of the associated technical and operational constraints. Currently, less than 4,000 calves are born though AI per year from close to 20,000 inseminations. Natural breeding methods are still preferred by most farmers especially on farms under the traditional extensive grazing systems. A study of breeding methods on 195

randomly selected farms in south western Uganda (Balikowa, 2004) showed that only 24 (12.3%) of the farms used artificial insemination (AI) to breed their animals. Ten (10) out of the 24 farms that use AI also used bulls alongside AI. A total of 171 farms (87.7%) used bulls only (See Table 11). In the northern, eastern and mid-western regions, the percentage of farmers using the bull only is even higher than in south western. In Karamoja, commercial AI services are not available.

Table 11: Breeding methods in south western Uganda

	Bull only	AI only	Bull + AI	Total
Bushenyi	22	1	3	26
Kabale	17	6	4	27
Mbarara	87	4	1	92
Ntungamo	21	1	0	22
Rukungiri	24	2	2	28
TOTAL	171 (87.7%)	14 (7.2%)	10 (5.1%)	195

Source: Balikowa, 2004

Several reasons were advanced for preferring the bull to AI method. The bull method was found to be convenient. Did not require monitoring the animals for signs of heat and did not depend on availability of a trained AI technician. AI technology was reported to be expensive and not readily available in many areas. The low conception rates, occasional calving problems and general lack of awareness in regard to the benefits of AI were among the major reasons for the low AI technology uptake. Provision of field AI services was also constrained by the poor physical infrastructure particularly the poor state of rural feeder roads, shortage of trained AI technicians and the limited and irregular supply of nitrogen for preserving semen.

4.5 Genetic diversity of the dairy herd

Although not specialised for milk production, indigenous cattle are still the principal producers of milk in Uganda. The major indigenous breeds are the Ankole (Sanga), Small East African Zebu and Karamojong. Other indigenous types include Nkedi, Kyoga, Nganda, Nyoro, Kigezi, and Lugware. Despite their poor production and reproductive performance, indigenous cattle are still the most popular in Uganda because of their versatility and adaptability to the local climatic and disease conditions. Indigenous cattle also serve many social and economic functions. They are kept for milk, beef, manure, draft power and various social functions. The total number of indigenous cattle was estimated at 10.64 million in 2008, representing 93.3% of the national herd of 11.4 million cattle. The number of indigenous cattle in the different regions is distributed in almost equal proportions except the northern which has a slightly fewer (Table 7)

The number of improved dairy cattle (exotics and crosses) is still small, estimated at 0.62 million in 2008 or 5.47% of the national herd. Most of the improved dairy breeds are found in the western region (48.5%) followed by central region (30.0%) (Table 12)

Table 12: Number of indigenous and improved dairy cattle by region

	Ankole		Zebu / Nganda		Dairy Exotics/ Crosses		Beef Exotics/ Crosses		Total Herd		Dairy Exotics/crosses + Indigenous	
Region	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Central	1,279,370	11.3	930,250	8.2	187,270	1.7	34,430	0.3	2,431,320	21.4	2,396,890	21.1
Eastern	126,663	1.1	2,218,947	19.6	125,280	1.1	16,580	0.1	2,487,470	21.9	2,470,890	21.8
Northern	171,258	1.5	1,459,772	12.9	6,310	0.1	3,490	0.0	1,640,830	14.5	1,637,340	14.4
Western	1,510,939	13.3	701,271	6.2	302,960	2.7	14,890	0.1	2,530,060	22.3	2,515,170	22.2
Karamoja	188,592	1.7	2,056,548	18.1	2,760	0.0	6,060	0.1	2,253,960	19.9	2,247,900	19.8
UGANDA	3,276,822	28.9	7,366,788	64.9	624,580	5.5	75,450	0.7	11,343,640	100	11,268,190	99.3

Source of data: MAAIF/UBOS, 2009

The most popular exotic dairy breed in Uganda is the black and white Holstein Friesian. Other common dairy breeds include Jersey, Guernsey and Ayrshire. The number of pure exotic dairy cattle is very small. Majority of the improved dairy cattle are crosses of exotic dairy breeds with indigenous types. Most of the crosses (probably 75-85%) contain varying levels Holstein Friesian blood.

There is a growing tendency to replace the low-yielding indigenous cattle with cross-breeds and exotic cattle. This is contained in a report by scientists from the Consultative Group on International Agricultural Research (CGIAR), which was presented at an international conference in Interlaken, Switzerland, on Monday 3rd September 2007 (Ref: http://www.thecattlesite.com/news/19315/ugandas-ankole-cattle-face-extinction)

4.6 Dairy Cattle Feeding

4.6.1 Feeding practices

Most of the milk in Uganda is produced by smallholder producers that rely almost entirely on rain-fed natural pastures. Only a small number of households keeping improved dairy cattle make effort to plant improved pastures, mainly Napier but also grasses such as Chloris *guyana, Brachiaria spp*, Kikuyu grass, and various other grasses and legumes species are cultivated at small scale. Very few farms produce enough fodder to meet the needs of their herds throughout the year. Hence, most animals thrive on sub-optimal energy levels for most of the year. A few commercial farms carry out serious fodder production and conservation which helps them to adequately cater for the feed requirements of the herds during dry seasons. Some commercial farms utilize only conserved forage, mainly silage and hay throughout the year.

The most common method of feeding cattle is by grazing on natural or planted pastures. Indigenous cattle kept under the traditional extensive management system rely on grazing natural pastures for their entire nutritional requirements. Stall feeding of indigenous cattle with cut fodder or concentrate feeds is not practiced in Uganda. A report on feeds and feeding practices in Uganda (EADD, 2009) revealed that most farmers graze exotics and crossbred cattle in the wet season and introduce stall feeding in the dry season. Only 20% of the farmers stall feed exotics and crosses in both the wet and dry seasons. The percentage

of farmers practicing stall-feeding in addition to grazing of exotics and crossbred cattle has been increasing over the last ten years from 5% to 30%. The percentage of farmers relying entirely on grazing of exotics and crosses decreased from 89% in 1999 to 51% in 2009 (EADD, 2009).

A study of grazing systems in south western Uganda (Balikowa, 2004) revealed that 85.6% of the farms keep cattle on fenced pastures while 9.7% rely on unfenced communal and private grazing land to feed their cattle. Only 5% of the farms were zero-grazing (stall feeding or tethering). Over 75% of the zero-grazing farms in south western Uganda were in Kabale district. Semi-nomadic pastoralist constituted 4.6% of all households keeping cattle. Over time, the number of fenced farms and stall feeding units has been increasing as semi-nomadic pastoralism is phased out.

4.6.2 Feed resources

Natural and planted pastures are the major components in the diet of both indigenous and improved dairy cattle in Uganda. The common naturally occurring pasture species vary from one region to another. In the traditional cattle corridor, common sources of forages include grasses such as *Themeda triandra*, *Brachiaria decumbens*, Digitaria spp., *Hyparrhenia filipendula*, *Panicum maximum*, *Chloris gayana*, *Cynodon dactylon*, *Paspalum dilatatum*, and *Hyparrhenia rufa*. There is always a severe decline in the quantity and quality of pastures during the dry season which is often accompanied by widespread invasion of unpalatable grasses (mainly *Cymbopogon afronardus* and *Sporobolus pyramidalis)* as well as bush encroachment, with subsequent overgrazing of the palatable species, mainly *Brachiaria brizantha and Themeda triandra.*

A previous study showed that about 25% of the households in south western Uganda plant fodder crops, mainly Napier and various legume species. However, only a small proportion (5%) of the farms, preserved fodder for dry season feeding (Balikowa, 2004). This explains why most farms frequently experience severe shortage of forage during the dry season. A more recent study in the central and eastern regions showed that Napier grass was the most important source of forage on smallholder farms keeping improved dairy cattle. Over 53% of the farms surveyed planted Napier (EADD, 2009). Farmers keeping improved dairy cattle are slowly learning to plant improved pastures/ fodder crops. Preferred types include grasses such as *Pannicum maximum, Pennisetum clandestinum*, *Chloris gayana*, *Bracharia brizantha*; herbaceous legumes such as lab lab *(Dolichos lablab)*, centro *(Centrosema pubescens), Desmodium spp*, stylo *(Stylosanthes guianensis),* siratro *(Macriptilium atropurpureum), alfalfa or lucern (Medicago sativa), Chamaecrista rotundifolia;* tree legumes mainly calliandra *(Calliandra calothyrsus),* leucena *(Leucaena leucocephala), and* gliricidia *(Gliricidia sepium)* as well as bulk forages, mainly Napier, Guatemala grass, Giant setaria, , forage sorghum and maize.

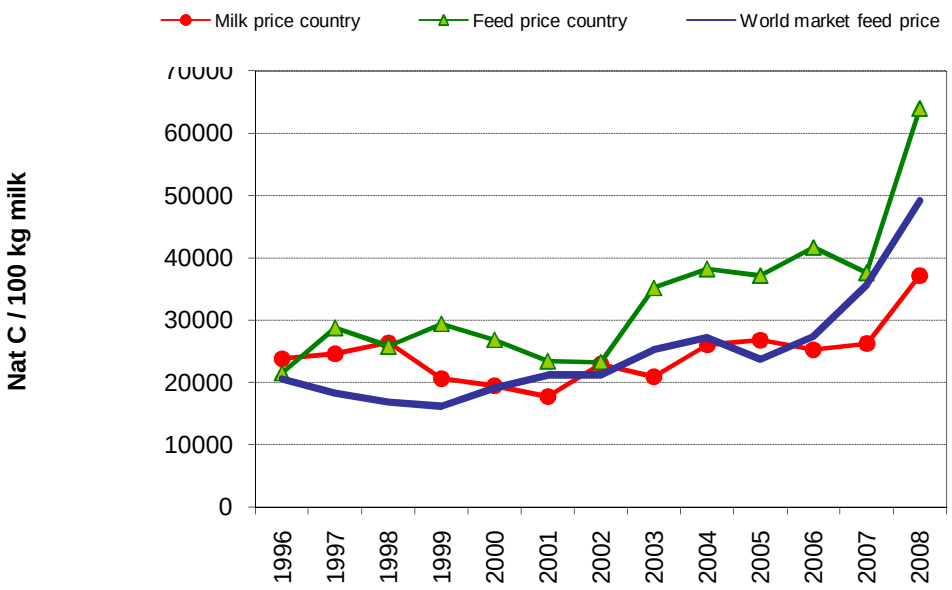
4.6.3 Supplementary feeding

A study of feeding practices in the south western region (Balikowa, 2004) showed that a small proportion (9%) of farms supplement milking animals with low levels of concentrate feeds. In some cases, milling bi-products such as maize and wheat bran were used in place of commercial concentrate. Almost all the farms gave salt, usually in form of rock salt and in

rear cases mineral salt blocks. Only 10% of the farms did not supplement at all. A recent study of feeding practices in the central and eastern regions revealed that only 4% of the households keeping cattle use supplementary feeds (EADD, 2009). Among the households that use supplementary feeds, only 38% use commercial dairy meal, 5% use home-made compound dairy rations while 50% supplement with milling bi-products such as maize, rice and wheat bran. Some households/ farms use by-products from the brewing industry. A few farms such as Jesa Farm near Busunju, 50km northwest of Kampala have embraced the concept of Total Mixed Ration (TMR) which refers to blending of all feedstuffs into a complete and well balanced ration that meets the nutritional requirements of the dairy cow.

The prices of raw materials for making commercial concentrate have been increasing steadily, making commercial feeds unaffordable to most farmers. Figure 7 shows that average price of commercial feeds in Uganda has always been above the world market prices (Hemme et al, 2009; FAO, 2010). Feed prices in Uganda are also much higher than the price of milk which makes it uneconomical to feed commercial concentrates for the purpose of boosting milk production. Currently, the average price of commercial concentrates is UGX 700,000 per ton while the average farm gate price of milk is UGX 450,000 per ton.

Figure 7: Milk and feed prices



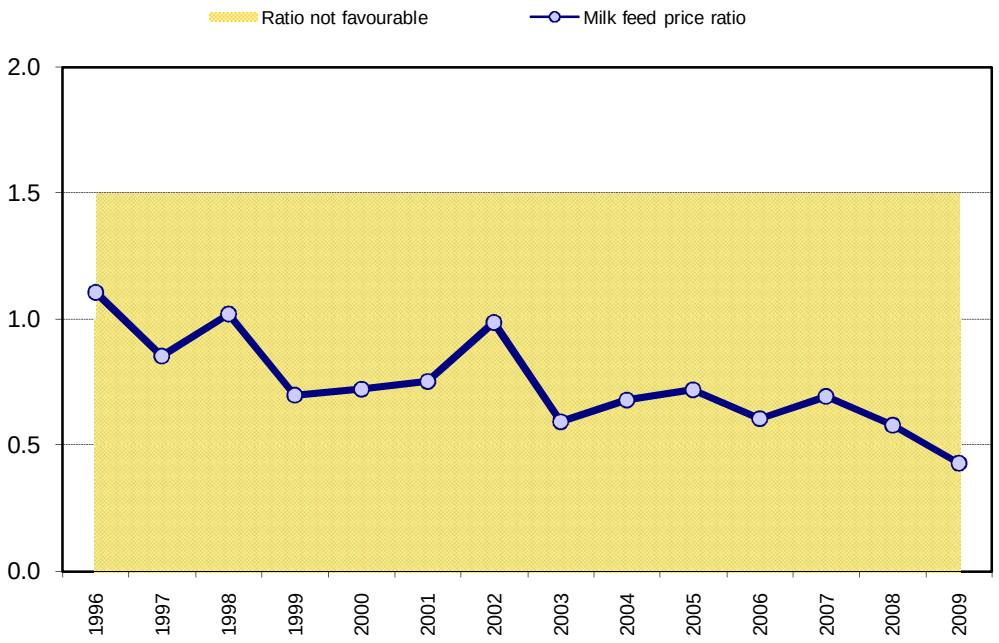
When the milk and feed prices in Uganda were compared (Hemme et al. 2009; FAO, 2010), results showed that the milk/feed price ratio (Fig. 8), does not favour the use of commercial concentrates for supplementing dairy animals. Feeding of commercial concentrates would be recommended if the milk/feed price ratio was above 1.5.

Figure 8 shows that overtime, the price of feed has been rising at a faster rate than the price of milk. In general, the milk/feed price ratio is still in the unfavorable range which means it is generally not cost efficient to feed commercial concentrates in Uganda. Indeed, most

farmers keeping improved dairy animals in south western Uganda as well as most parts of central and eastern Uganda do not feed commercial concentrates. Majority rely on home grown legumes, crop residues and milling by-products to supplement natural pastures.

Only farmers who sell directly to consumers and hawkers near the major urban centres such as Kampala, Jinja, Entebbe, Mukono, Luwero, Mityana, Masaka, Iganga, Mbale Gulu, and Lira and obtain a fairly high price, between UGX 800 and 1200 per litres find it economically justifiable to feed commercial concentrates. Several commercial feed processing companies have been setup in the country over the last 2 decades. However, the number of cottage feed millers also exploded over the same period. The result has been a steady decline in the quality of commercial feeds on the market, majority of which comes from the informal sector. In 2005, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) developed The National Animal Feeds Policy which is expected to address issues of quality assurance in the animal feeds industry.

Figure 8: Uganda's milk / feed (corn/soya bean meal) price ratio



4.7 Milk Utilization and Losses at the Farm Level

According to the 2008 national livestock census, about 34.7% of the milk produced in Uganda is sold. This means that 65.3% of the milk does not leave the gates of the producing household. With 42.7% of the milk produced being marketed, the western region is the main source of marketable milk. Table 4.8 shows the estimated milk production and sale in the different regions based on the MAAIF/UBOS 2008 Livestock Census data.

Table 13: Estimates of milk production and sale by region

Region	Milk production (L/week)	Milk production (Litres/Yr)	Volume of milk produced (L/ day)	Volume of milk sold (Litres/ day)
Central	3,685,584	191,650,368	526,512	205,866
Eastern	2,266,504	117,858,208	323,786	115,915
Northern	824,408	42,869,216	117,773	49,936
Western	4,009,010	208,468,520	572,716	244,550
Karamoja	2,037,282	105,938,664	291,040	18,627
Total	**12,822,788**	**666,784,976**	1,831,827	**634,893**

Source of data: MAAIF/UBOS 2009

From Table 13, it is obvious that the western region produces most milk in the country and is also the main source of marketable milk in Uganda followed by the central region.

Previous reports (DDA, 2004) indicate that 65-70% of the milk produced in the country is marketed, leaving only 30-35% at the farm. The milk which remains on farm is either consumed by the family, fed to calves, offered as gift, processed into traditional dairy products for home consumption or wasted due to spoilage. Milk which is not sold by households owing to the temporary wet season glut is included in the postharvest farm level losses. A study of post harvest losses of milk and dairy products showed that 5.8% of the milk was wasted at farm level while 11% was the loss along the commodity chain due to spillage and 10% due to spoilage (DDA, 2004). Since the study was done in 2003, there has been tremendous improvement in the handling and transportation of milk particularly in the informal sector. Bulk transporters first chill the milk before transporting it in insulated road tankers. This should have contributed to significant reduction in losses along the commodity chain. At farm level, losses which were high owing to failure to market the milk in the wet season should have reduced significantly due to the improvement in the rural milk collection infrastructure and processing capacity which have taken place in the industry since 2006 when Sameer Agriculture and Livestock Ltd began operations in Uganda.

4.8 Demand and preferences for milk and dairy products

A detailed study of Uganda's dairy market conducted by Synovate, formerly known as Steadman Research Services, made it possible to characterize Uganda's milk consumers basing on a number of factors. The consumer study targeted both male and female aged between 10 and 40 years in various socio-economic classes. Among the respondents were consumers of milk as a stand-alone drink, consumers of dairy products or milk in other forms such as tea as well as lapsed/non consumers of milk and milk products. All respondents were consumers of products in the beverage category. The study also included a retail audit which targeted 42 retail outlets in the specified primary market areas and 48 retail outlets in the secondary market areas. The target primary market area which includes Kampala, Jinja, Entebbe, Masaka, Mbarara, Mbale, Lira, Fort Portal, Kabale and Tororo is Uganda's most important dairy market, absorbing more than 90% of all the milk and dairy products sold in urban markets. The key research findings are used to define the demand and preferences for milk and dairy products in Ugandan.

4.8.1 Income distribution

The poor constitute the largest part of Uganda's population. More than two third of the people interviewed earned less than US$ 350 per month. The proportion of the population that could comfortably afford processed and packed milk was quite small. This is probably one of the major reasons why the informal market continues to flourish in Uganda. Kampala city had the largest number of people earning more than UGX 700,000 (Approx. US$ 350) per month. This partly explains why Uganda's most important milk market is Kampala city and the surrounding Municipalities of Entebbe, Mukono, and Jinja.

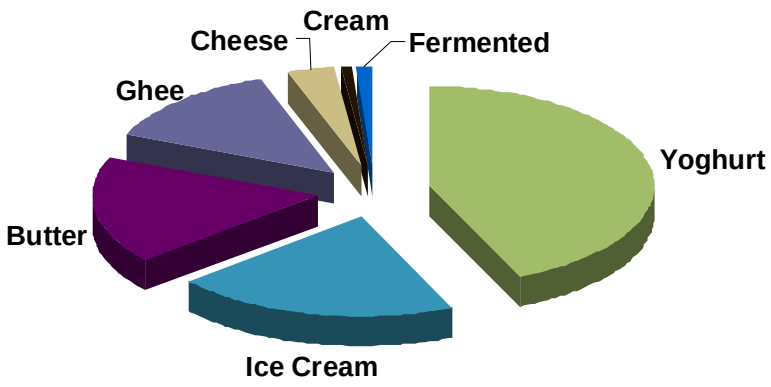
4.8.2 Frequency of consumption milk and dairy products

Although a significant proportion (70%) of the population took milk at least once a week, only 36% could afford milk every day. Butter was not a popular product. Over 80% of the population did not use butter at all or would take a long time without testing it. Only about 7% of the population could be regarded as regular or frequent users. Cheese was even less popular than butter. Over three quarters of the population did not even know the taste of cheese. Only about 4% could be regarded as regular cheese users

4.8.3 Most frequently consumed dairy products

Among the different dairy products, yogurt was most popular followed by ice cream, butter and ghee in that order (Figure 9). The demand and consumption of yogurt is growing steadily. Users cut across all social classes. There is a great potential for further expansion of the yogurt market in Uganda. Yogurt making has attracted many micro-processors who operate in the backyard of residences, and some of them are not registered or regularly inspected by Dairy Development Authority.

Figure 9: Most frequently consumed dairy products



The most popular beverages were water, juice, black tea and soda. Although not among the most popular beverages, milk and yogurt had a significant and fast growing population of users.

4.8.4 Frequency of consumption of milk and dairy products in the different regions

The highest proportion of consumers taking milk and dairy products at least twice a day was in central region (63%) followed by western (54%) and Eastern (54%). These proportions represent the relative importance of the different regions as target markets for milk and dairy products. The central region has the highest average income levels as well as supply and availability of processed dairy products. These two factors favour higher levels and frequency of consumption. Consumers in western region have better access through on-farm sources and enjoy the lowest farm gate price of milk in the country. The western and central regions had the highest proportion of consumers who take dairy products at least twice a day. The regional differences may be explained in terms availability of the products, and income levels of the population. There central and western regions perform better than other regions in both income levels and availability of the products.

Chapter 5

5. ANALYSIS OF THE DAIRY VALUE CHAIN

5.1 Collection, Bulking and Transportation

5.1.1 Milk bulking and transport infrastructure

The infrastructure for rural milk collection is not well developed in most parts of the country except in the South Western region and to a less extent the Central region. The Eastern and Northern regions lack rural milk collection centres with functional cooling equipment. A total of 398 milk cooling tanks with a total capacity of 591,000 litres are installed in rural areas for milk collection. Most of these (75%) are installed in the South Western region and 15% in the Central region. Chilled milk is delivered to processing plants and the raw milk markets in insulated road tankers. There are 92 privately owned insulated road tankers in the country and their total capacity is 746,200 litres.

5.1.2 Major milk producing areas

The western and central regions are the most important milk producing areas. The national livestock census of 2008 confirmed that the western region is the leading producer of milk among the five regions. Analysis of milk production by the different regions shows that the Western region (south west and mid-west) produces 34.9% of the national total estimated at 1.08 billion in 2010. The region produces an average of 1.0 million litres per day of which about 0.77 million litres (77%) is marketed. The western region also has the lowest average farm gate price for raw milk of UGX 355 compared to the national average of UGX 442. The central region produces about 0.94 million litres per day of which 0.73 million litres (78%) is marketed. Table 14 shows the milk produced and marketed in the different regions.

Table 14: Milk produced and marketed in the different regions

Region	Milk produced per year (Million Litres)	Milk produced per day (Million Litres)	Milk marketed per day (Million Litres)	Marketed proportion
Central region	341.89	0.94	0.73	78%
Eastern region	195.84	0.54	0.27	50%
Northern region	103.64	0.28	0.14	50%
Western region	364.06	1.00	0.77	77%
Karamoja	75.28	0.21	0.01	5%
TOTAL	1,080.70	2.96	1.92	64.8%

The following factors explain why the western region is the leading producer of milk in Uganda. The western region:

- Has the largest number of cattle, estimated at 2.55 million head in 2008, or 22.3% of the national total of 11.4 million.

- Has the largest number of improved dairy cattle (exotics + crosses) estimated at 302,960 or 48.5% of the national total of 624,5805
- Has the highest number of milked cows estimated at 413,300, that is 27.2% of the national total of 1,519,590
- Has the highest proportion of adult cows that are milked (35.6%);
- Has the second highest average milk yield per cow of 9.7 litres per week. The highest was 9.8L per week for the central region. These figures appear to be gross under estimation especially for cows in the central and western regions which have a significant population of improved dairy animals.

Although the western region currently has 27 districts divided into two milk sheds namely mid western and south western, only eight (8) districts located in the south western milk shed namely Bushenyi, Ibanda, Isingiro, Kiruhura, Mbarara, Ntungamo, Rukungiri and Kabale are the most important sources of milk (see the milk shed map, Figure 4.2). Other districts in the western milk shed, namely Kabarole, Masindi and to a less extent Kamwenge and Buliisa also produce reasonable quantities of marketed milk.

5.1.3 Milk producer cooperatives in south western region

In each of the eight major milk producing districts of south western Uganda, dairy farmers are organized into primary cooperative societies which form dairy cooperative unions at district level. Majority (65-75%) of the dairy farmers in these districts belong to the cooperative structure through which they market their milk. Uganda Crane Creameries Cooperative Union (UCCCU) is the umbrella body for dairy cooperatives in western Uganda. The Union has 9 district level cooperative unions with a total membership of about 100 primary cooperative societies and 15,000-16,000 member dairy farmers. Tables 15 shows the average volume of milk collected and marketed per day by the eight (8) district level cooperative unions in south western Uganda that sell milk to the formal market.

Table 15: Milk collection & delivery by dairy coop unions in south western Uganda

Name of Dairy Cooperative Union	District of operation	Potential collection (L/day)	Actual collection (L/day)	Delivered to Processors (L/day)
Ankole Dairy Products Co-op Union	Kiruhura	60,000	35,000	30,000
INKA Dairy Co-op Union	Ibanda, Kamwenge	8,000	5,000	4,000
Bushenyi Dairy Industry Co-op Union Ltd.	Bushenyi, Mitooma, Nsiika, Rubirizi	10,000	7,000	5,000
Mbarara Dairy Farmers Co-op. Union	Mbarara, Isingiro	60,000	42,000	40,000
Ntungamo Dairy Farmers Co-op. Union	Ntungamo, Rukungiri	50,000	40,000	30,000
Rukungiri-Kanungu Dairy Coop Union	Rukungiri, Kanungu	5,000	4,000	3,000
Sheema Dairy Coop. Union	Kibingo	10,000	7,000	5,000
Kazo Dairy Coop Union	Kiruhura	40,000	32,000	30,000
TOTAL	**13**	**243,000**	**172,000**	**147,000**

5.1.4 Milk deliveries to processing companies

The cooperative societies and unions bulk their members' milk and sell it mainly to the formal markets (processing companies). However, processing companies are not able to purchase all the milk produced by the cooperative members. This is particularly evident in the wet season. As a result, most farmers deliver only a fraction of their farm produce to the cooperative milk collection centres and sell the rest to milk traders. About 25-35% of dairy farmers in the south western region are not members of the cooperative societies and unions. In the central region, majority of the farmers (75-80%) are not members of producer cooperatives. They sell their produce, mainly to milk traders, but also to individual consumers in their neighborhood and occasionally to processing companies. Farmers that sell directly to consumers or to milk traders usually get a slightly higher price than those that sell through the cooperative structure. This is probably one of the reasons why many farmers in the central region are not motivated to join milk producer cooperatives.

Currently all dairy companies procure most of the milk they process from south western Uganda. They buy milk from producer cooperatives, private companies of milk traders as well as individual dairy farmers that deliver directly to the processing company's milk bulking facilities. The largest milk processing company, Sameer Agriculture and Livestock Ltd buys 85% of the daily intake from south western and 15% from central region. The second largest processor, Jesa Farm Dairy buys about 50% of the milk processed from farmers in central region, 35% is delivered by private companies that procure milk from south western region and 15% (about 4500-5000 litres per day) is produced on the company's dairy farm.

Table 16 shows the average daily milk intake by processing plants and mini dairies. The volume of milk delivered to processing companies per day is still small compared to the total

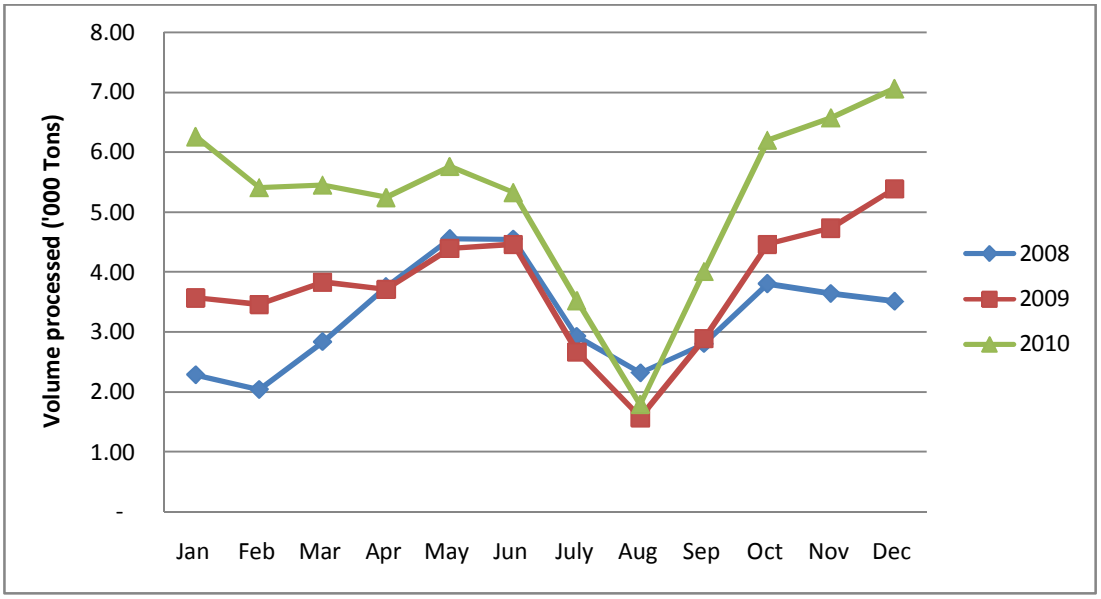
national production. Currently, the average daily milk intake by 14 processing plants and mini dairies is 244,664 litres, representing 39.6% of their total installed capacity.

Table 16: Daily milk intake by processing plants and mini dairies in Uganda

Name of Company	Location	Rated capacity ('000 L/day)	Milk intake ('000 L/day)	Capacity Utilised (%)
Sameer Agriculture & Livestock Ltd	Kampala	430	166.4	38.7
Jesa Farm Dairy	Busunju	40	32.9	82.3
GBK Dairy Products (U) Ltd	Mbarara	48	24.1	50.2
Shumuk Dairy Products (U) Ltd	Mbarara	40	2.0	5.0
Birunga Dairy	Kisoro	14	8.3	57.4
Nirma Dairy & Foods Ltd	Entebbe	10	0.5	4.7
Uganda Industrial Research Institute	Kampala	10	0.3	3.0
White Nile Dairy	Jinja	5	1.4	28.3
Toro Dairy Cooperative Society Ltd	Fort Portal	4	2.0	50.0
Maama Omulungi Dairy	Kampala	8	2.0	25.0
MADDO Dairies	Masaka	3	1.2	40.0
Paramount Dairies	Mbarara	2	1.8	75.0
Rainbow Industries (SIMKA Ice Cream)	Kampala	2	1.0	50.0
FIDO DIDO Ice cream	Kampala	2	0.8	50.0
TOTAL		**618**	**244.7**	**39.6%**

Sameer Agriculture and Livestock Limited (SALL), is the largest processor, handling 68% of the total daily milk deliveries to processing companies. SALL signed milk supply contracts with eight (8) dairy producer cooperative unions in south western Uganda. However, because of the limited milk processing capacity, SALL and other processors are not able to absorb all the milk bulked by the dairy cooperative unions. As a result, the unions and primary cooperative societies receive only a fraction of their members' produce in the wet season. The unions receive 150,000-200,000 litres per day, representing about 65% of what their members could potentially supply, estimated at 250,000-300,000 litres per day. SALL is only able to purchase 130,000-160,000 litres per day from the cooperative unions. This represents about 80-85% of SALL's daily raw milk intake. SALL also buys 15-20% of the daily milk intake from dairy producers in the central region. Figure 10 shows the trend in the volume of milk procured and processed by SALL over the last three years. There is a steady increase in the monthly milk intake by SALL.

Figure 10: Monthly milk deliveries to Sameer Agriculture and Livestock Ltd



5.1.5 Farm gate price for milk

During the wet season, the farmers' cooperatives receive much more milk than what the processing firms can absorb. They are compelled to sell the surplus to the informal market. The farm gate price is lowest in the wet season, averaging UGX 250-350 per litre in the south western region and 300-400 in the central region. In the dry season, there is an apparent scarcity of milk. Both processors and traders aggressively compete for the farmers' produce and the average farm gate price rises to an average of UGX 350-450 per litre in the south western region and UGX 400-600 per litre in the central region. The other regions, namely northern, eastern and Karamoja experience a deficit of marketable milk almost through the year. The farm gate price in the milk deficit region ranges between UGX 600 and 1200 in both the wet and dry seasons.

The scarcity of milk during the dry season was severe during the months of August and September of 2009 and 2010. The average farm gate and consumer prices reached their highest ever in 2009. The average farm was UGX 600-700 in the south western region and UGX 800-1000 in the central region during the months of August and September 2009. Figure 11 shows the average farm gate price of milk paid by processing companies between 2008 and 2010. An exceptionally severe dry season during the months of August and September lead to abnormally high farm gate prices in 2009 and 2010. The 2008 was a typical normal year in terms of milk volumes and prices.

Figure 11: Average farm gate price of milk

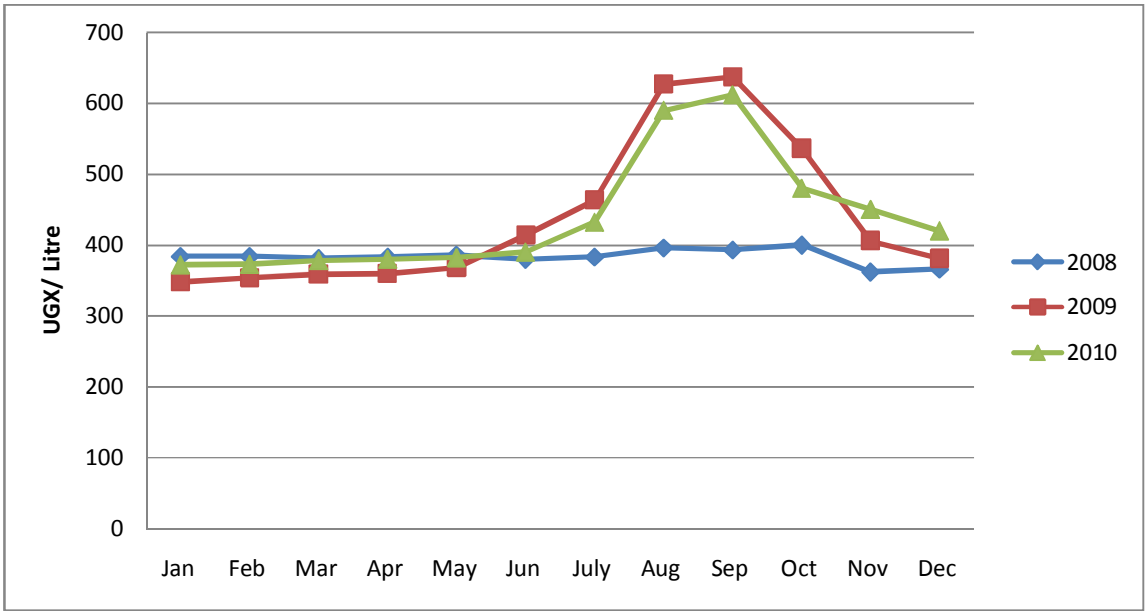
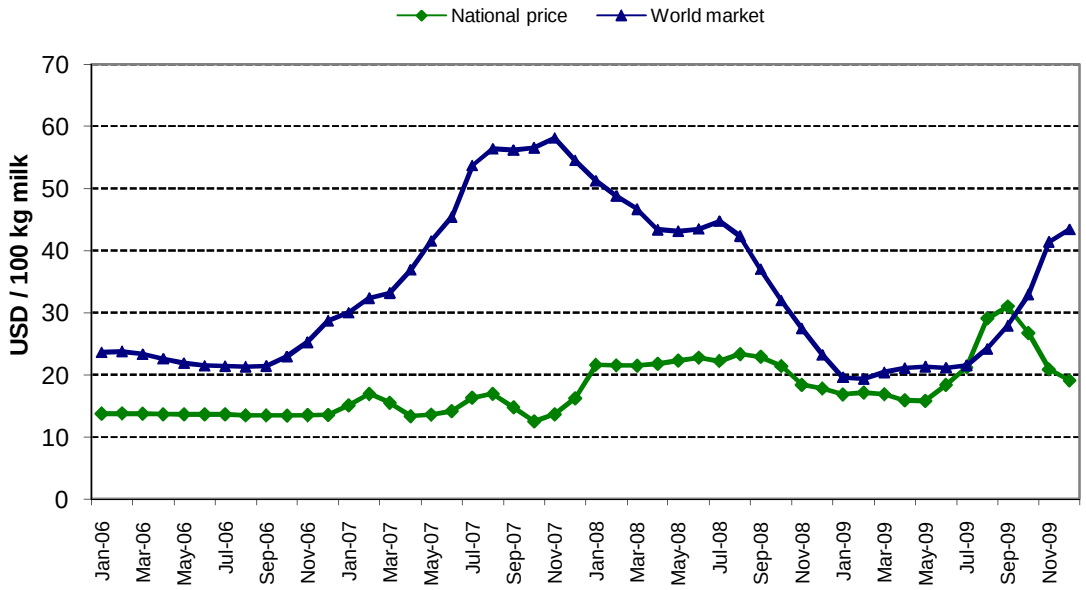


Fig 12 shows greater stability in the trend of farm gate milk prices in Uganda compared to the world market prices. It should be noted that the average price of milk in Uganda is far below the world market prices. Indeed, Uganda is one of the few countries in the world that are low cost producers of milk (Hemme et al., 2007).

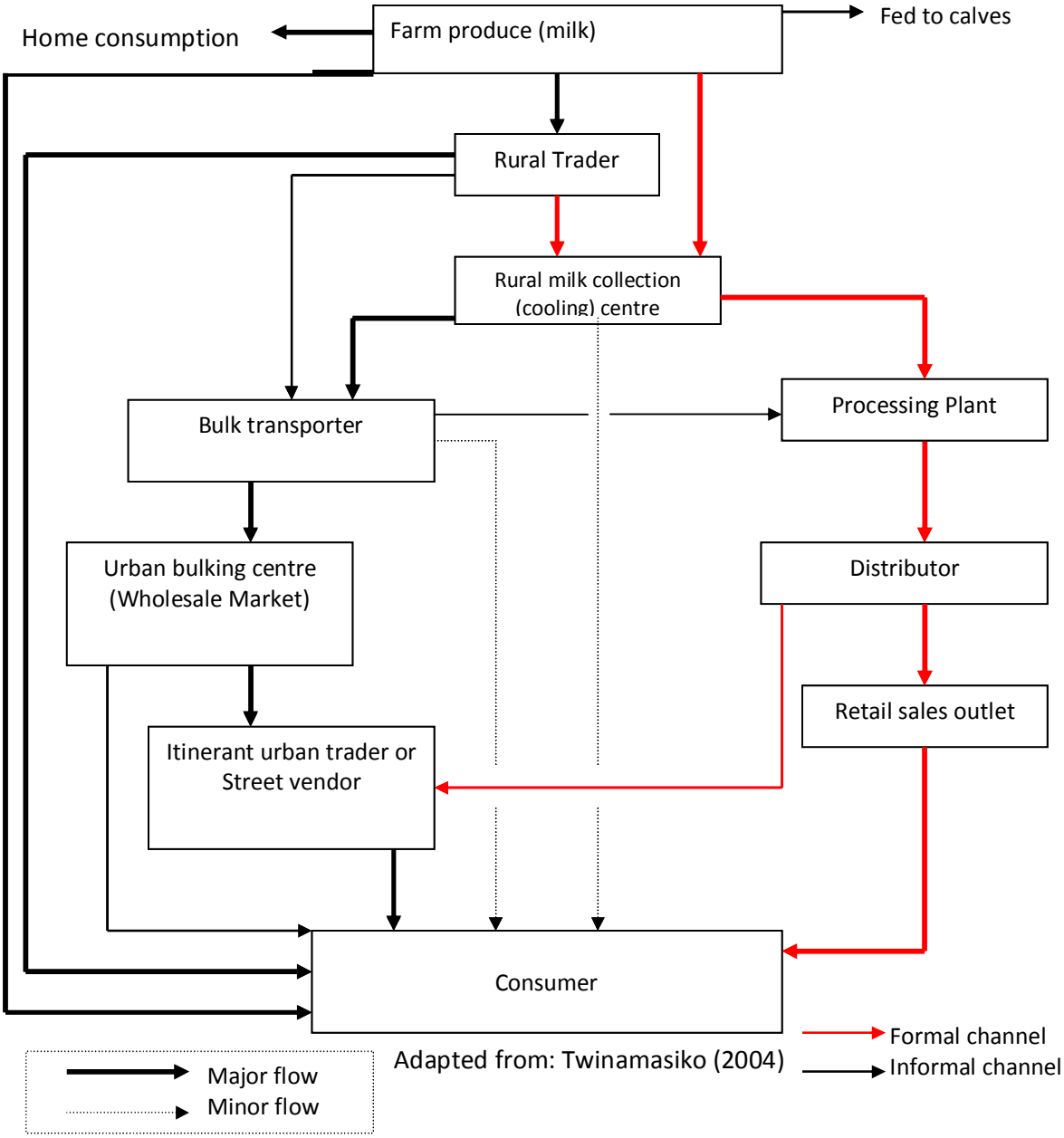
Figure 12: Monthly milk prices in US Dollars



5.2 Unprocessed Milk Trade

There are two milk marketing channels in Uganda namely the formal and informal channels. The term **informal channel** refers to the traditional way of marketing in which raw milk is procured from farmers and sold directly to consumers without prior processing and packaging. In most cases, the only value added is chilling and transportation. The informal market has a wide range of operators. It includes direct on-farm milk sales by producers to consumers in neighbourhood as well as a sales through a chain of middlemen (market agents) including village milk collection agents, small scale rural traders, itinerant urban traders (handling less than 300 litres/day) and the large scale bulk transporters-cum-wholesalers of chilled milk (up to 30,000 litres per day). Fig. 13 shows the flow of milk through formal (processed) and informal (raw milk) marketing channels.

Figure 13: Milk flow through the formal and informal marketing channels



A very day, a total of 800-1000 small scale mobile traders purchase milk from farmers within a radius of 5 to 40km from the major urban centres of Kampala, Entebbe/ Wakiso, Mukono and Jinja and use bicycles or motorcycles to deliver it to consumers in and around the urban centres. Each small scale trader delivers between 50-120 litres of milk each day. A total of 60,000 to 100,000 litres per day is sold by these mobile traders to consumers in the major urban centres, mainly Kampala City and its suburbs.

A total of 30-40 bulk transporters-cum-wholesalers with insulated road tankers deliver between 218,000 and 306,000 litres of chilled milk per day to the major urban centres of Kampala, Entebbe/ Wakiso, Mukono and Jinja. Table 17 shows the names of the leading bulk transporter/ wholesalers of chilled unprocessed milk.

Table 17: Leading bulk transporters/ whole sellers of chilled unprocessed milk

Name of Firm/ Trader	District of operation	Volume in dry season (L/day)	Volume wet season (L/day)
Sibyangu	Kiruhura & Mbarara	20,000	30,000
Kaaro Karungi	Kiruhura & Lyantonde	10,000	15,000
Katwe Fresh Milk	Kiruhura	10,000	10,000
Awamu	Mbarara	10,000	15,000
Nyabushozi	Kiruhura	10,000	15,000
Juma Walusimbi	Kiruhura	8,000	10,000
Mulika Richard	Mityana & Gomba	7,000	9,000
Nswere	Kiruhura	20,000	30,000
Grace of God	Mbarara	7,000	7,000
Maama Omulungi	Kiruhura	7,000	7,000
Agaba	Kiruhura & Nakaseke	8,000	8,000
Hamba	Nakaseke	5,000	5,000
Karuhinda	Kiruhura & Nakaseke	5,000	5,000
Tuwereza	Kiruhura	10,000	10,000
Muk Xtra	Kiruhura	5,000	5,000
Jimmy	Kiruhura	5,000	5,000
Wakaliga	Kiruhura	0	5,000
Bukenya Abasi	Sembabule	4,000	5,000
Hajji Kalema	Gomba	2,500	5,000
Mpola Fred	Kyankwanzi	3,000	5,000
Trust Dairy	Kiruhura	3,000	5,000
Nyamirongo	Kiruhura	3,000	5,000
Ntambala		4,000	5,000
Kiiza Christopher		3,500	5,000
Others (16 in number)		48,000	80,000
TOTAL		**218,000**	**306,000**

The wholesalers have a network of rural milk collection centres with milk coolers in the central and south western regions. Farmers and agents of the traders deliver warm milk to the rural milk collection centres where it is chilled and later transported in insulated road tankers to the major urban centres. The wholesalers usually own several retail sales outlets in the major urban centres where they deliver and sell the chilled milk. They also deliver milk to other retail sales outlets whose owners do not have road tankers. At the retail sales outlets, milk is kept in cooling tanks from where it is sold to consumers without prior processing.

In addition to buying milk directly from farmers, the mobile traders (hawkers) also purchase chilled milk from the bulk transporters/ wholesalers. Each trader buys 50-150 litres of chilled milk per day from the transporters/ wholesalers and delivers it to regular customers in various parts of Kampala city and the surrounding areas. It is estimated that an average of 325,000-360,000 litres of raw milk is sold in the major urban centres of Kampala, Entebbe/Wakiso, Mukono and Jinja every day by traders. The volume sold is highest in the wet season, estimated at 406,000-448,000 litres per day and lowest in the dry season, estimated at 243,000-269,000 litres per day. There are two wet seasons lasting a total of seven months (March, April, May, June, July, October, November) and two dry seasons lasting a total of five months (January, February, August, September and December). The bulk milk transporters/ wholesalers deliver 70-85% of all the unprocessed milk sold in the major urban centres. The small scale, mobile traders numbering 800-1000 deliver the remaining 15-30% estimated at 51,000-142,000 litres depending on the season.

It is estimated that 87% of the marketed milk in Uganda is sold through the traditional/ informal market without prior processing and packing. The informal market largely caters for all consumers in rural areas and the remote urban centres as well as majority of consumers in the major urban centres. The retail price of unprocessed milk is always lower than that of processed milk. In urban areas, the price ranges between UGX 800 and 1200 per litre in the wet season and UGX 1000-1400 in the dry season. In rural areas consumers pay much lower prices. The lowest price of UGX 300-500 (US$ 0.12-0.21) per litre is observed in the most productive milk shed of south western Uganda while the highest price is observed in the milk deficit eastern and northern regions (UGX 600-1200 per litre). Consumers of unprocessed milk in urban centres pay much higher prices (UGX 1,000-1,400 or US$ 0.42-0.58 per litre). Despite this high price, unprocessed milk is always much cheaper than processed and packed milk. The retail price of one litre of fresh pasteurised milk is UGX 1400-1600 in the wet season and UGX 1600-1800 (US$ 0.67-0.75) in the dry season. In August and September 2009, the consumer price of fresh pasteurised milk reached its highest level ever, averaging UGX 2200-2400 per litre, equivalent to US Dollars 1.15-1.25.

5.3 Formal Milk Trade

5.3.1 Milk processing capacity

Uganda has a limited capacity to process milk into value added products. The total installed capacity of the 14 operational milk processing plants and mini dairies is 618,000 litres per day and their average daily milk intake is 244,660 litres, equivalent to 40% of their total installed capacity. Fig. 13 shows the daily milk intake and idle capacity of the 14 operational milk processing plants and mini dairies. The biggest processor, Sameer Agriculture and Livestock Ltd (SALL) handles an average of 166,400 litres per day, which is 38.7% of the rated capacity of the plant. Only half of the plants and mini dairies are able to utilise at least 50% of the rated plant capacity.

Figure 14: Daily milk intake by processing plants & mini dairies ('000 L)

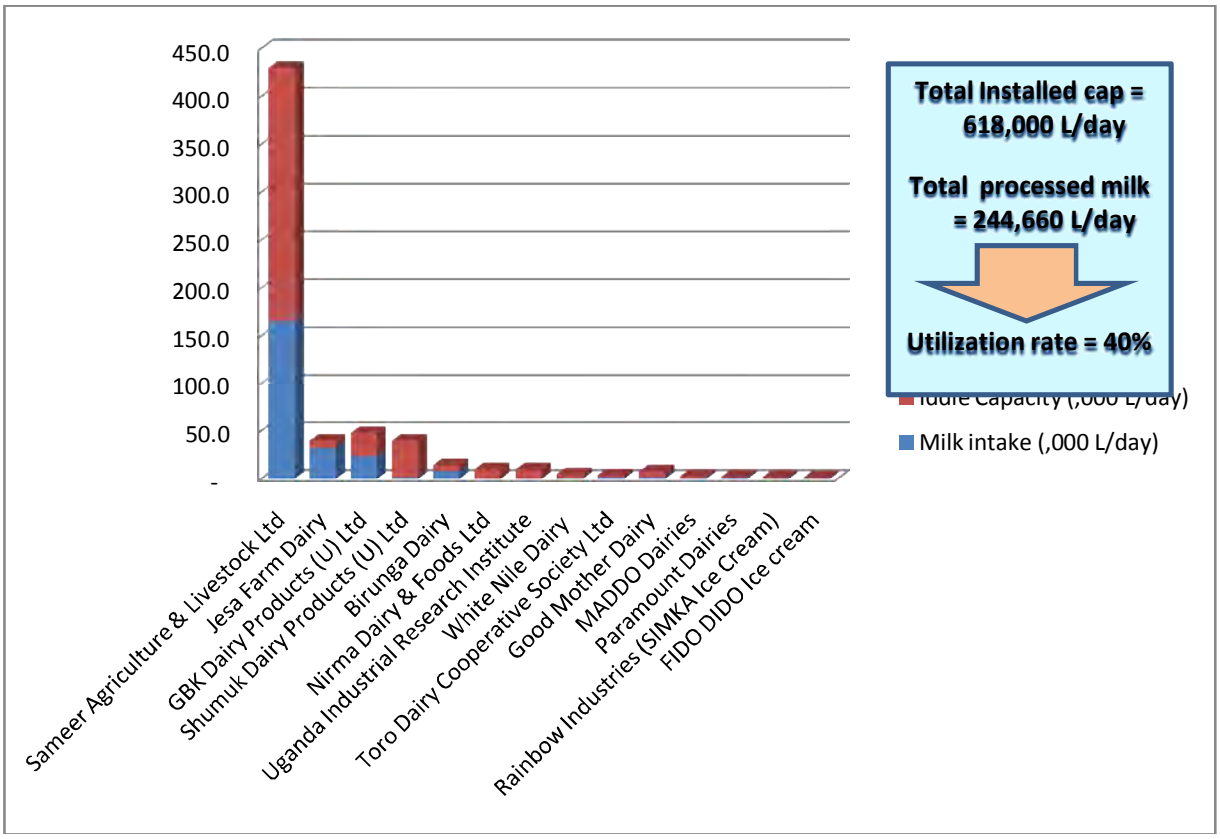
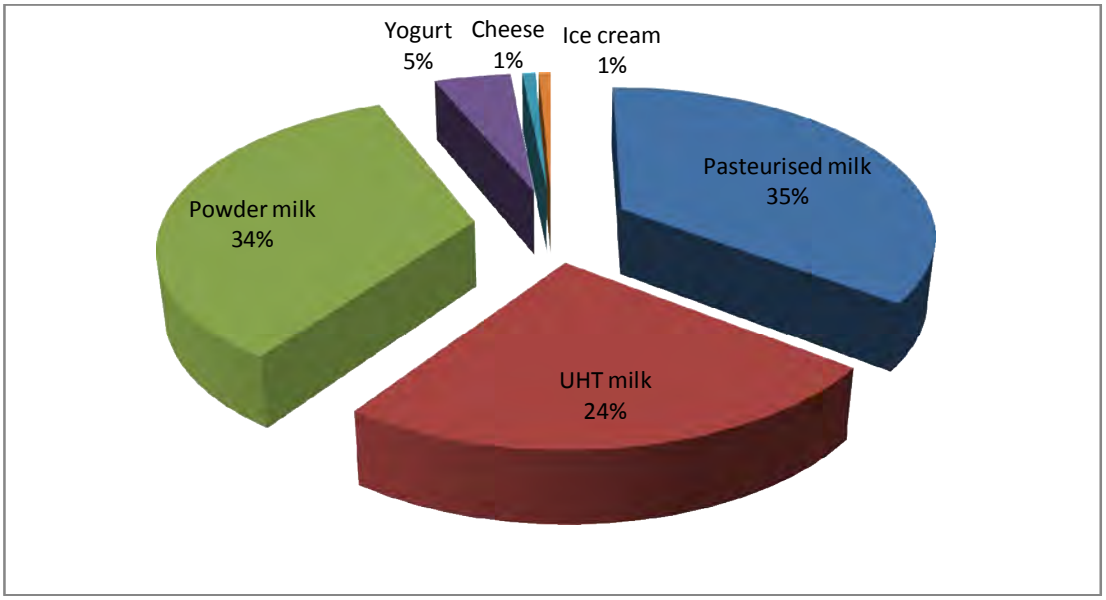


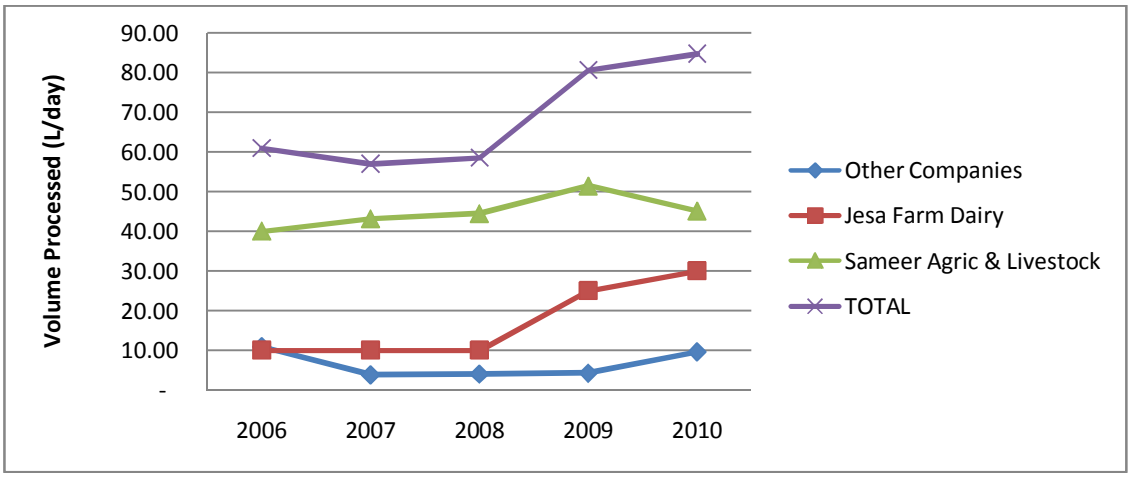
Figure 14 shows the proportion of the total milk intake by processing plants and mini dairies that goes into the production of different dairy products. A total of 86,647 L/day equivalent to 35.4% of the daily milk intake goes into production of pasteurized milk; 59,136 L/day (24.2%) goes into UHT. Thus, a total of 145,783 L/day, equivalent to 59.6% of the total milk intake goes into production of liquid milk (pasteurized milk and UHT); An average of 83,558 L/day (34.2%) is processed into SMP and Whole Milk Powder in the ratio of 2:8. while only 15,319 litres per day (6.3%) is processed into other value added products: yogurt, 11,519 L/day (4.7%); cheese, about 2,000 L/day (0.8%) and ice cream, 1,800 L/day (0.7%). There are many cottage, micro-scale processors of yogurt, ghee, ice cream and cheese. However, the volume of milk handled by this category of processors is not significant.

Figure 15: Proportion of milk used to make different products



The total volume of milk processed into value added products is only about 12.7% of the total marketed milk estimated at 1.92 million litres per day in 2010. One of the reasons for the low processing capacity utilization (average 40%) from the point of view of processors is the strong informal market. However, despite the vibrant raw milk trade, the formal market has continued to register stead growth. Looking at statistics from two major producers of pasteurized milk, the product which faces stiff competition from the informal market, sales have continued to grow over the last 8 years from an average of 30,000 litres per day in 2003 to 86,647 litres per day in 2010 (see Figure 15). Sales of other products such as UHT milk, yogurt, ice cream and instant dry milk have followed a similar trend. Production of UHT milk by Dairy Corporation Ltd/SALL more than doubled over the same period. This is a clear indication that the formal market is growing steadily. Some of the drivers of formal market growth include the increase in average household income in urban areas, and expansion of the urban population.

Figure 16: Pasteurized milk processing (L/day)



There are 3 other milk processing plants/ mini dairies that are not functioning (see Table 18). Their combined installed capacity is 40,000 litres per day. Gouda Gold, a small cheese plant near Kampala is being down-sized from the original processing capacity of 15,000 L/day to 5,000L/day and is expected to resume production by the end of 2011.

Table 18: Non-operational milk processing plants and mini dairies

	Company	Location	Installed capacity (Litres/Day)	Product
1	Country Taste	Mbarara	25,000	Pasteurised milk, yogurt
2	Gouda Gold**	Mukono	5,000	Cheese
3	Kaisa Fresh Milk	Kamuli	10,000	Pasteurised milk, yogurt
	TOTAL		**40,000**	

*** Is expected to resume production soon after structuring*

Uganda Crane Creameries Cooperative Union Ltd, the umbrella body for dairy producer cooperatives in south western Uganda is setting up a new dairy processing plant in Mbarara. Construction of the buildings is almost complete. The farmers are targeting a plant with a rated capacity of 50,000 litres per day (See Table 19). The motivation to set up their own processing plant has been the frequent disappointments from the milk processing companies, particularly the inability to buy all the farmers' milk in the wet season, and the low factory-gate price, averaging UGX 380-500 per litre. Another local investor is setting up a small plant with a capacity to process 10,000 litres per day in Ntinda, a suburb of Kampala. The premises are ready and the investor is in the processing of purchasing equipment.

Table 19: Milk processing plant under construction

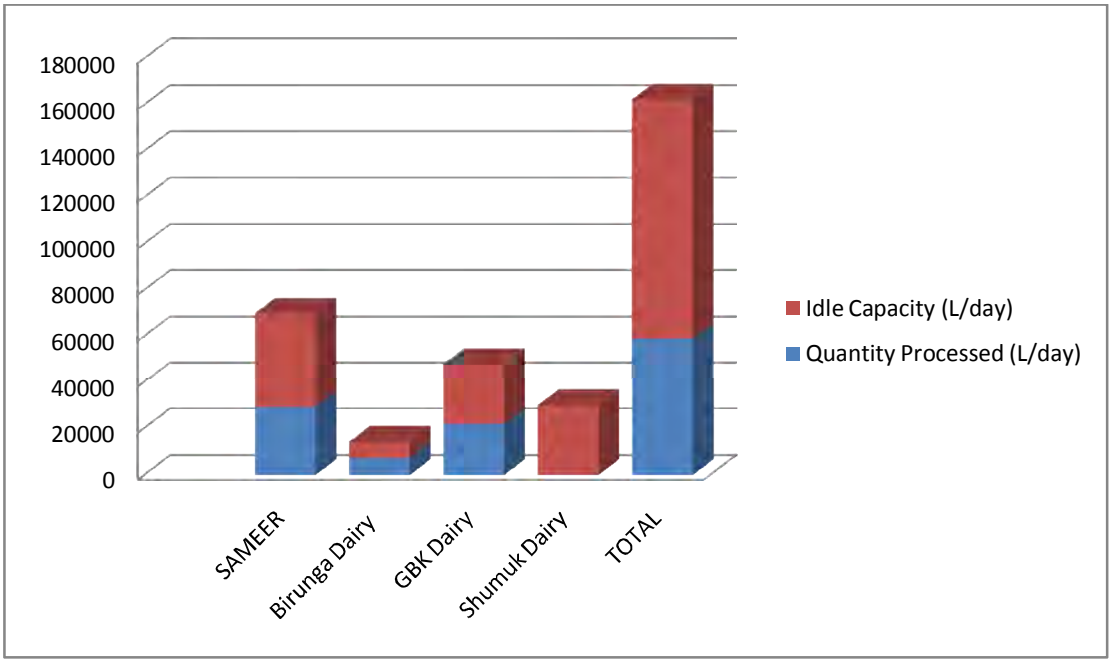
Name of Company	Location	Planned Capacity L/day	Products to be made
UCCCU Dairy Plant	Mbarara	50,000	Pasteurised milk, UHT, yogurt,
Napier Fresh Milk	Kampala	10,000	Pasteurised milk + yogurt
Total Capacity		**60,000**	

5.3.2 Major dairy products produced

(a) UHT Milk

By 1995 Uganda had only one UHT milk processing plant. The plant owned by government at that time (Dairy Corporation) had a capacity of 16.4 million litres per annum. Two additional UHT plants, namely GBK Dairy Products (U) Ltd and Western Highland Creameries Ltd, now operating as Shumuk Dairy Products (U) Ltd where set up in Mbarara by private investors, in 1996 and 1997 respectively. Their combined output was 32 million litres per annum. In 2006, Birunga Dairies with a capacity of 15 million litres per annum was set up in Kisoro, south western Uganda by another private investor. Fig. 16 shows the installed and utilised capacity of the three operational UHT milk processing plants in Uganda. Their combined output is only 59,136 litres of UHT milk per day, representing 36.4% of their combined installed capacity of 162,400litres per day.

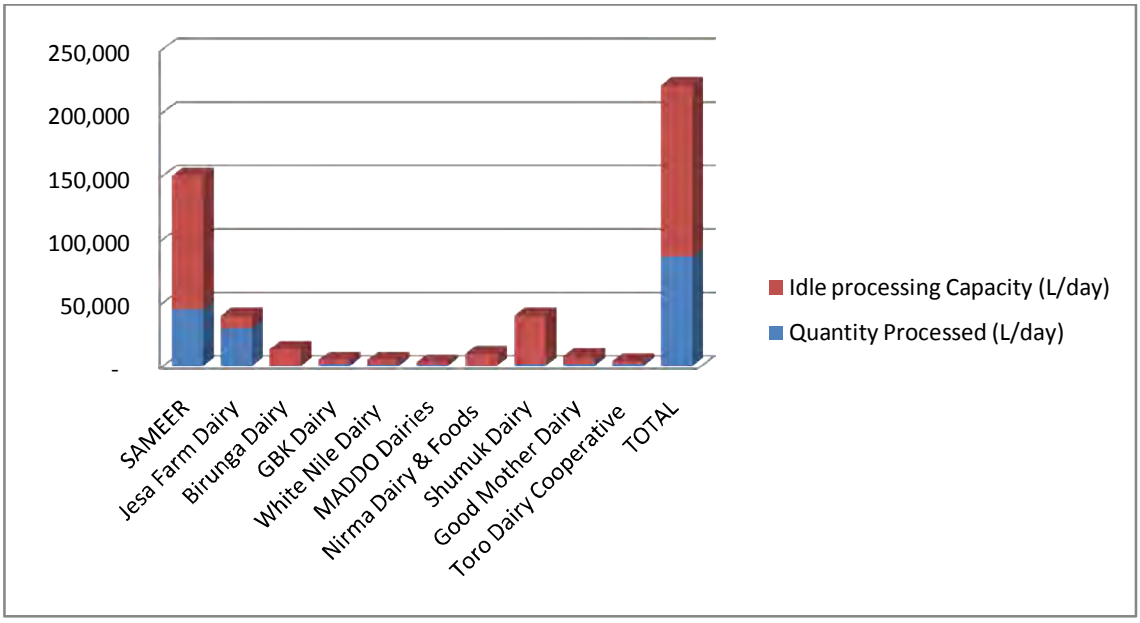
Figure 17: Utilised and idle UHT processing capacity



(b) Pasteurized milk

Production of pasteurized milk remains the largest processing activity in the dairy industry. A total of 86,647 litres per day equivalent to 35.4% of the total milk intake by all processing plants/mini dairies goes into production of pasteurized milk. Two companies (Sameer and Jesa) are the major players in this market segment, producing 86.6% of the total production (Figure 17). The total installed capacity for pasteurised milk is 221,600 litres per day and the average capacity utilisation is 39.1%. SAMEER is the market leader, controls 53% of the market followed by Jesa with 36%. The rest of the companies share 11%.

Figure 18: Pasteurized milk production in Uganda



(c) Ice cream

Eleven (11) ice cream micro-scale processors located near Kampala City (see Table 20) are the major producers of ice cream in Uganda. Together, the companies produce about 20,000 litres of ice cream per week. The ice cream is sold in super markets, ice cream parlours, fast food restaurants and ice cream kiosks in Kampala city and other major towns.

Table 20: Ice cream processors in Uganda

No	Company	Location	Production (L/day)	Max Prod. L/day	Name of Product
1	FIDODIDO	Kampala (Plot 37/39, 5th Street Industrial area)	800	1600	Fido dido Ice cream
2	Cream of Uganda	Kampala (Bweyogerere)	250	500	Kooksy ice cream
3	Snowman's	Kampala (7th Street Industrial area)	400	800	Frenze ice cream
4	Quest Dairy Products	Kampala (Plot 1732 Church Road Kansanga)	400	800	Quest ice cream
5	RICK	Kampala (Muyenga)	400	800	Rick ice cream
6	Rainbow Industries	Mukono	1000	2000	Simka ice cream
7	Zinellos	Kampala (Kamwokya)	400	800	Zinellos ice cream
8	MACK	Kampala (Kasanvu zone Namuwongo)	400	800	Mack ice cream
9	Piccadilly	Kampala (Nakasero shoppers stop plaza AB 16)	180	360	Piccadilly ice cream
10	CIAO CIAO	Not registered	170	340	Ciao Ciao ice cream
11	LILY Ice cream	Kampala (Uganda Industrial Research Institute)	100	200	LILY Ice cream
	TOTAL		**4500**	**9,000**	

The ice cream market is still small. The product is not readily available in most major towns and municipalities of Uganda. The unreliable/ irregular power supply is a major challenge affecting ice cream processing and marketing. It is difficult to maintain a very reliable and efficient cold chain.

5.4 Milk Distribution and Retailing

5.4.1 Distribution and sales

There are two commercial models for distribution and sale of dairy products in Uganda. Model I is based on company owned marketing infrastructure and resources while the Model II is based on outsourced private sector infrastructure and resources. Model I was used by the former government owned Dairy Cooperation Ltd (DCL). The latter acquired and

owned premises in many towns and also hired commercial buildings in others to set up regional distribution depots. The company also hired staff to manage the depots and sales outlets and acquired a fleet of vehicles to transport the products to the different depots.

After taking over the assets and management of DCL, Sameer Agriculture and Livestock Ltd (SALL), changed from distribution model I to model II where most of the resources and marketing infrastructure are outsourced. Private business persons are given the tenders to distribute SALL products in pre-defined market areas within Kampala city and other parts of the country. The distributor deposits a sum of money with SALL as security and for each consignment the distributor pays cash for all products taken. The distributor is also responsible for renting the depot, arranging transport, managing sales, and paying necessary taxes as an independent business operator. The only incentive from the processor is the special distributor price and exclusive distribution rights for specified locations/ market areas. Model II saves the processor the inconvenience and costs associated with acquiring distribution infrastructure and resources as well as managing the distribution network. Distribution Model II is also used by many beverage companies.

Other dairy companies use a mixture of distribution models I and II, utilising both company owned and outsourced resources and infrastructure. Some companies own distribution trucks, use company staff to deliver products and set up company depots in some towns. However, they also use private business persons to transport products and manage sales. Mini dairies and cottage processors tend to rely on company owned assets and staff for marketing their products.

5.4.2 Milk consumption

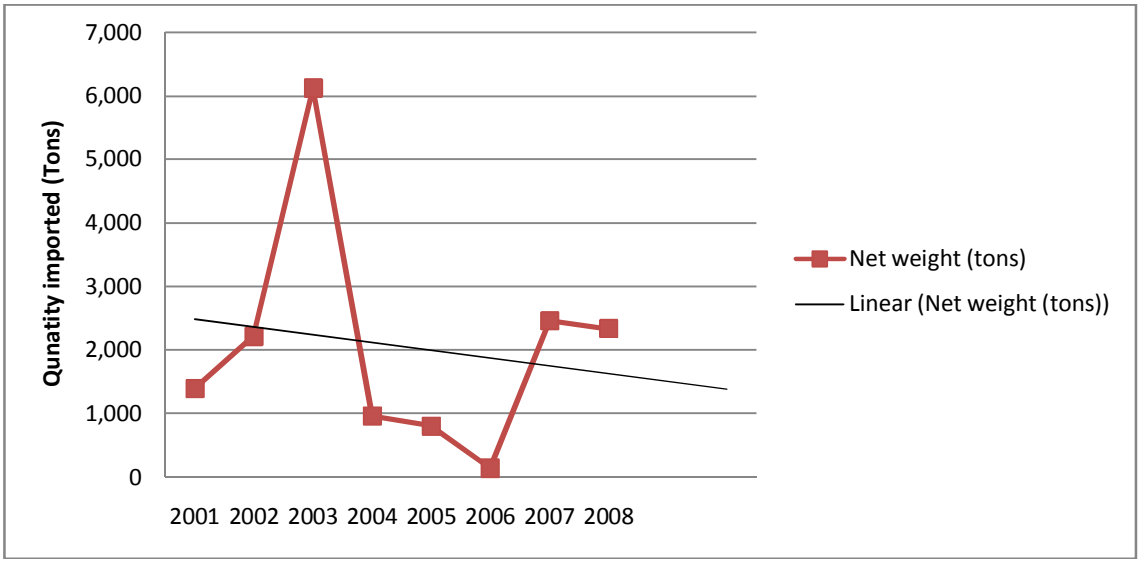
Out of the milk produced annually, it is estimated that 70% is marketed and 30% is consumed on farm. The culture of milk consumption is still poor. Per capita milk consumption is currently estimated at 35 litres per person per year. Analysis carried out by IFCN shows that Uganda's annual per capita milk consumption is growing at a rate of 2.2% per year (Hemme et al. 2010). Despite the current low per capita consumption, there is a big potential to significantly increase the demand for milk and dairy products owing to the rapidly growing urban population.

5.5 Milk and Dairy Products Exports and Imports

5.5.1 Import of milk and milk products

Uganda continues to import milk and milk products from different countries worldwide. This is partly attributed to the limited local capacity to produce adequate quantities of high quality dairy products as well as the narrow range of processed dairy products made by local companies. The business community continues to import various dairy products such as cheese, butter, yogurt, ice cream, UHT milk, whey, skimmed milk powder and whole milk powder. However, as the local processing capacity grows, the quantity of milk and dairy products imported has been declining progressively. Figure 18 shows the trend in quantity of milk and dairy products imported between 2001 and 2008.

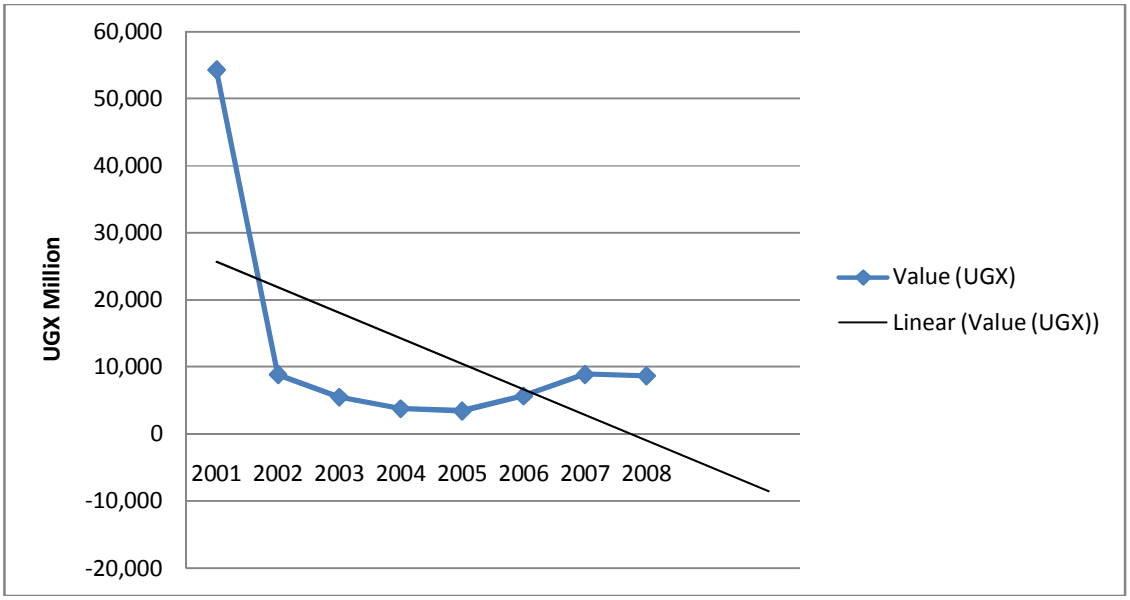
Figure 19: Quantity of milk and dairy products imported



Kenya is the major source of milk and dairy products imported into Uganda. About 85% of the gross annual import of milk and dairy products is sourced from Kenya. Other major source countries include United Arab Emirates (4%), South Africa (3%), Belgium (2%) and France (2%). Other sources include Malaysia, Poland, Netherlands, Germany, Switzerland, Italy, United Kingdom, India and Denmark. Other less important sources are Pakistan, China, Canada, and USA. Kenya is the main source of UHT milk, Skimmed milk powder, whole milk powder, yogurt, butter, cream and whey.

The total value of imported milk and milk products has also been declining with time. Figure 19 shows the trend in value of imported milk and dairy products between 2001 and 2008.

Figure 20: Trend of the value of imported milk and dairy products

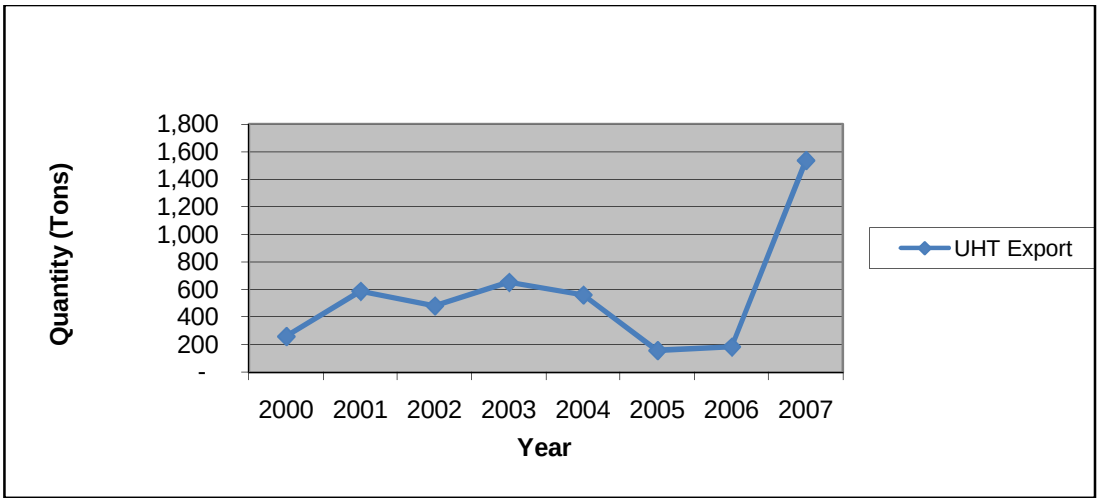


5.5.2 Export of milk and dairy products

From Figure 5.10, it is evident that the value of exports remained lower than that of imports until 2008 when SALL started production and export of milk powder. Exports grew from US$ 306,000 in 2004 to approximately US$ 5 million in 2008, surpassing that of imports.

Until 2008, UHT milk was the main dairy product exported to regional markets, including Kenya, Rwanda Tanzania, DR Congo, Southern Sudan and Mauritius. Informal dairy trade takes place across all borders of Uganda but the volume traded may not be significant. The volume of milk exported declined steadily between 2003 and 2005 but began to rise in 2006. Between 2000 and 2006, Uganda exported an average of 380 metric tons of milk per year. Figure 20 shows the trend in quantity of dairy exports between 2000 and 2007.

Figure 21: Quantity of UHT milk exported between 2000 and 2007



After installation of the milk powder plant by SALL in 2008, the company commenced production and export of SMP and whole milk powder to many African countries and the Middle East. This led to a dramatic increase in the quantity and value of milk and dairy products exported by Uganda. Export revenue increased from US$ 0.306 million in 2004 to an estimated US $ 5 million in 2008, effectively surpassing the value of dairy imports for the same year (UIA, 2009).

Chapter 6

6. SAFETY OF MILK AND DAIRY PRODUCTS

Smallholder producers are the main source of milk produced, marketed and consumed in Uganda. However, these producers face many challenges which contribute to the production and marketing of low quality milk in most parts of the country. Lack of clean water, particularly in the dry seasons, poor hygiene at farm level, rampant use of plastic milk receptacles, traditional milking and milk handling practices, poor milk transport infrastructure and lack of an efficient cold chain in most parts of the country are among the factors that frequently contribute to rapid deterioration in the quality of milk along the commodity chain. Another concern for quality and safety of milk in Uganda is the fact that over 80% of the marketed milk goes through the informal market.

A study of the quality and safety of milk along the raw milk commodity chain in Uganda (N. Grillet et al, 2005) showed that there were two main critical points within the raw milk commodity chain, namely i) the poor hygiene conditions leading to contamination of milk right from the farm to consumer; and ii) the inefficient preservation system that allows bacteria to develop quickly during transportation to distant markets. Samples of milk taken at farm level in Mbarara district, south-western Uganda had high levels of bacteria, as high as 2×10^6 colony forming units per millilitre (cfu/ml) which increased 150-fold during transport to Kampala, about 300km away. The study recommended a number of strategies for improving the quality of milk including 1) adopting and promoting hygienic milk handling practices and 2) use of various techniques such as cooling, small-scale pasteurization and the lactoperoxidase system to preserve raw milk.

A previous study of the milk supply chain in Uganda revealed many potential hazards along the entire supply chain from the farm to the consumer. The study also documented the associated risk factors. Table 21 is a summary of the hazards and risk factors at different levels of the supply chain (B. Faye and G. Loiseau, 2002).

Dairy Development Authority has implemented a number of reforms in the handling, transportation and marketing of milk which resulted in significant improvement in the quality and safety of milk marketed through both the formal and informal markets. The reforms are based on **The Dairy (Marketing of Milk and Milk Products) Regulations, 2003** being implemented by DDA as well as the **code of hygienic practice for milk and milk products** that was developed by DDA in collaboration with Uganda National Bureau of Standards (UNBS).

Before Dairy Development Authority was established in 2000, bulk milk traders used to boil milk in huge sauce pans placed over open flames (see Fig. 21) before selling it to vendors. Boiling was done to prevent spoilage of milk transported in plastic jerry cans, on open pick-up trucks over long distances up to 400 km and at ambient temperatures (26-32 0C). The journey would take between 4 and 6 hours. By the time milk reached the urban centres, particularly Kampala, it was about to go bad and sometimes it was already sour. In order to prevent further deterioration, traders would boil it as soon as it was offloaded.

Table 21: Hazards and risk factors along the milk supply chain in Uganda

Level	Hazards	Risk factors
Farm	• Fecal Contamination : E. coli, Salmonella, Clostridium • Contamination by environmental germs : psychrotrophes flora (Listeria, Pseudomonas), Enterobacterias, yeast and fungus • Multiplication of bacteria on milking material • Contamination by pathogen bacteria : Staphylococcus aureus, Steptococcus, Listeria, Mycobacterium tuberculosis, bovis, Brucella, E. Coli • Contamination by chemical residues • Lipolysis and raw milk turning rancid • Proteolysis : gelification of UHT milk, decreasing of cheese yield; appearance of sour components • Inhibition of the lactic fermentation : problems for milk processing	• Transmission by the hands of the milkman • Contamination by the animal at milking, by the tail and the splashes when the bucket is near the animals • Milk in open air at milking time • Inefficient cleaning and disinfecting of material and/or poor drying • Healthy carrier animals: *Mycobacterium, Brucella*, • Animals with mastitis: *Staphylococcus, E coli*, • Man : *Staphylococcus sp., Steptococcus sp.* • Environment : *Listeria sp.* • Non-respect of waiting time for veterinary medicine • Frequent and brutal decanting • Collecting milk with mastitis • Collecting milk from animals treated with antibiotics
Transport	• Growing of microbial flora • Contamination by material	• Carrying time too long, at high temperature • Cleaning and inefficient disinfecting of material and/or bad drying
Collecting center	• Cross-contamination • Human contamination • Contamination by environmental germs • Development of psychrotrophic flora : synthesis of proteolytic thermostable enzymes • Development of coliform flora • Lipolysis	• Cleaning and inefficient disinfecting of materials • Absence or bad quality control of the milk before mixing • Hand contacts with the milk at the time of sampling • Use of contaminated water for cleaning the materials • Temperature of cooling tanks not regulated and too lengthy storage • Absence of cooling • Manual filling of the tanks from the top
Dairy plant	• Cross contamination • Recontamination by environmental germs • Persistence of micro-organisms	• Absence or bad quality control of the milk • Non hermetically sealed packing • Poor hygiene at packaging • Absence of thermal treatment or insufficient treatment : no respect of time/ temperature
Consumer	• Food-borne disease : diarrheic syndrome, listeriosis, tuberculosis, brucellosis • Poor preservation of milk	• Consumption of contaminated raw milk • Poor quality (fragility of the components) High temperature and too lengthy preservation

Source: B. Faye and G. Loiseau (2002)

In order to improve quality along the raw milk supply chain, DDA on behalf of government, outlawed the use of plastic containers for handling and transporting milk. Farmers were advised to use aluminium or stainless steel cans to transport milk from farms to collection

centres while bulk milk traders/ whole sellers and processors were required to set up milk cooling plants in rural areas and to transport bulk volumes of milk in insulated road tankers.

Government also outlawed the practice of boiling large quantities of milk for sale in open metallic containers that was common in the major urban centres particularly Kampala, Jinja, Mbale, Pallisa, and Kumi. As an alternative measure, traders were mobilised to form groups and facilitated to acquire locally fabricated batch pasteurizers (Fig. 22)) which permit indirect heating of the milk while monitoring the temperature and time. This equipment also permits heating of the milk under better hygiene conditions. The sale of loose unprocessed milk in the informal market remains the biggest challenge as far as improving quality and safety in the milk supply chain is concerned in Uganda.

Figure 22: Boiling of milk in a Kampala suburb

Figure 23: Locally fabricated batch milk pasteurizer

Chapter 7

7. DAIRY PRODUCTION AND THE ENVIRONMENT

7.1 Environmental Concerns in the Dairy Industry

7.1.1 Overgrazing and soil erosion

Cattle have many positive and negative impacts to the environment. The management system determines the scale of impact. In the extensive grazing systems commonly practiced in the traditional cattle corridor, overgrazing is very common in the dry season. For most rangelands, the effects of overgrazing are seasonal and disappear at the onset of the rain season. However, in some areas within the cattle corridor, the land does not fully recover from overgrazing leading to the appearance of permanently bear grounds and signs of soil erosion. In Karamoja region, overgrazing of the relatively secure communal grazing grounds is partly responsible for the widespread signs of severe soil erosion characterized by numerous gullies and extensive bear grounds. In areas such as south western Uganda where communal grazing is limited because most farmers have fenced their farm land, it is possible to minimize overgrazing if farmers maintain the recommended stocking rates. However, overstocking is very common leading to rampant overgrazing of fenced farms particularly in the dry season. The effects of overgrazing of farms located on hill slopes in Ntungamo, Kabale, Rukungiri, Kanungu, Kisoro, Kabarole, Bushenyi several other districts are more severe and difficult to deal with.

7.1.2 Traditional rangeland improvement

Some traditional practices of rangeland improvement such as cutting of trees, bushes and thickets in order to allow growth of pastures on rangelands may be detrimental to the environment of carried out on a large scale. Although this is a desirable farming practice, if widely carried out in a particular location, the effect would be similar to that of deforestation. Burning of rangelands and swamps before the rain season starts is a common practice in the traditional cattle corridor aimed at removing the decaying and dry grass and shrubs. This practice has a number of negative environmental effects as it destroys micro-flora and fauna, and ultimately disrupts the ecosystem.

7.1.3 Manure accumulation on intensive farms

Smallholder farmers keeping improved dairy cattle under intensive zero grazing/stall feeding systems within or near major urban areas experience the problem of accumulation and disposal of manure. The stench and flies associated with manure that is not properly disposed of is a serious environmental concern for residents in the same neighbourhood.

7.1.4 Methane emissions by cattle

Cattle are known to produce methane one of the greenhouse gases with adverse environmental effects owing to their role in global warming. An estimate of the quantity of methane gas produced by Uganda's cattle population between 2000 and 2030 using the Livestock Analysis Model (LAM) developed by the United States Environment Protection Agency showed that the total methane emissions from cattle in Uganda was 337,796 tons in the year 2000 (C. Ebong et al, 2007). The amount was projected to triple by the year 2030

unless mitigation measures were put in place. Among indigenous cattle breeds, the Zebu and Nganda had the highest methane emissions per unit of product, generating approximately 1 kilogram of methane per kilogram of milk produced, while the Ankole cattle emitted approximately 0.566 kg of methane per kilogram of milk produced. On the other hand, the improved dairy breeds emitted only 0.123 kg of methane per kilogram of milk produced. Results of this study showed that the cattle sector in Uganda requires significant investments to reduce methane emissions in line with the Clean Development Mechanism under the Kyoto Protocol.

7.1.5 Polythene bags and flooding

The dairy industry is also adversely affected by negative environmental impacts created by other human/ natural activities. In eastern Uganda, flooding which affected districts around Lake Kyoga affected the productivity of rangelands. Intensive smallholder dairy farms continue to suffer the effect of poor disposal of polythene bags used to carry groceries from markets and shops. Many dairy animals have been diagnosed with polythene bags in their stomachs after suffering severe health complications which often culminate in death of valuable dairy animals.

Chapter 8

8. EMPLOYMENT IN THE DAIRY SECTOR

The dairy industry provides numerous direct and indirect employment opportunities at both household and enterprise level. Many people are employed at different levels of the dairy value chain, from farm level milk production; rural milk collection, bulking and transportation; milk processing and marketing of value added products; to supply/distribution of inputs and provision of support services. The informal milk market provides immense employment opportunities to various categories of market agents including rural milk collectors/ procurement agents, milk transporters and the itinerant rural and urban retailers. Getting accurate employment statistics in the dairy industry has always been a huge challenge. This is because the informal sector plays a dominant role along the entire dairy value chain.

According to the 2008 national livestock census, 1.663 million households keep cattle. This is equivalent to 26.1% of all households in the country. Dairying provides immense employment opportunities for both family and hired farm workers because it is a labour intensive operation. Farm workers spend a lot of time on various farm activities such as feeding/grazing, watering, cleaning, milk transport and marketing. Extensive grazing grazing of large herds requires fulltime engagement of one or more persons per day. Other farm activities consume a varying number of person-hours per day per farm. An estimate of the total person-hours required to look after the entire national herd may provide a rough estimate of the level of employment in the dairy industry. A previous study of labour productivity in the different dairy farming systems (Otto Garcia, et al, IGAD LPI Working Paper No. 09 – 08) showed that labour input per cow decreases as herd size increases. Labour input varies from about 100 to 1,400 person-hours per lactating dairy animal per year. Farms with the more productive improved dairy animals achieve higher labour productivity levels than farms with indigenous animals. Higher labour productivity results in lower wage costs per 100 kg ECM. Smallholder intensive farms keeping a few improved dairy cows are not able to achieve high labour productivity levels. The study showed that all farms except the smallholders make higher returns to labour than the wages paid per labour input. Smallholder farms are not able to achieve high returns to labour because of the small herd sizes, low productivity of animals, low milk prices, and the high mortality rates of animals. The higher returns on dairy labour imply that farmers make a higher income by working on their dairy farms than doing most of jobs in their location. This confirms that dairying is a very competitive form of employment compared to many alternative employment opportunities in the same locality. Availability low cost labour and land rent favours high returns to dairy labour and may be a great incentive for investment in dairying.

The formal milk marketing channel offers a wide range of employment opportunities which include persons directly employed by milk processing companies, persons involved in distribution and marketing, suppliers of inputs, and providers of support services. Uganda has a small number of dairy plants and mini dairies, majority of which employ a small number of fulltime workers ranging between 10 and 50. Only Sameer Agriculture and Livestock Limited (SALL) with the largest milk processing capacity and large network of milk bulking and transport infrastructure employs a significant number of workers. Currently

SALL employs 515 people with a salary/wage bill of UGX 150 million per month. SALL also provides indirect employment to 3,000 people associated with the companies supply network (http://www.enteruganda.com/brochures/sameerpro03.html). This formal employment created by SALL probably represents 70-75% of all employment opportunities in Uganda's formal milk marketing channel.

The informal market offers greater employment opportunities for small scale market agents in both rural and urban areas. A large network of rural milk collectors, transporters and itinerant retailers handles about 80% of the marketed milk in Uganda. In the urban areas, market agents handle 50-250 litres of milk per day while in the rural areas, the volume handled ranges between 5 and 55 litres per day. A previous study in Kenya (Omore et al 2001) revealed that every 100 litres of marketed milk creates one full time job. In Uganda, the average volume is probably much lower than that in Kenya because of the low productivity of dairy animals.

Dairy producer cooperatives have significantly contributed to employment creation in the dairy commodity chain. Dairy cooperatives which undertake collective marketing employ one milk assistants or milk collection centre manager, 1-2 casual labourers and a security guard per milk collection centre. Each cooperative owned milk collection centre therefore employs 3-4 fulltime workers. Most cooperatives also employ a fulltime secretary manager to manage the businesses of the cooperative. Hence, dairy cooperative employ 2-4 fulltime workers. There are 214 active dairy cooperative in Uganda. Almost all the active (128) primary cooperative societies in south western Uganda own milk collection centres which employ 2 or 4 fulltime workers. In the central region, there are 54 active dairy cooperatives but only 18 of them have milk cooling plants and employ 2-4 fulltime staff.

The dairy industry offers numerous job opportunities to manufacturers and suppliers of veterinary drugs and chemicals, animal feeds, milk processing additives, milk processing and handling equipment, farm equipment and machinery, and packaging materials among others. The dairy industry makes significant contribution to the economy through the immense employment opportunities created per 100 litres of marketed milk.

CHAPTER 9

9. DAIRY INSTITUTIONS

The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is responsible for all functions in agriculture and livestock sub-sectors. Administratively, the Ministry (MAAIF) is divided into two Directorates, namely Directorate of Animal Resources and Directorate of Crop Resources. The Directorate of Animal Resources (DAR) is responsible for all programs and activities related to livestock, fisheries, apiculture and sericulture. Its key role is policy formulation and regulation. Several statutory bodies under MAAIF play different roles in the dairy industry. There are other public institutions outside MAAIF that also play various roles in the dairy industry. Some of the key institutional players in the dairy industry are described below.

9.1 Directorate of Animal Resources

The Directorate for Animal Resources (DAR) in the Ministry of Agriculture Animal Industry and Fisheries (MAAIF) is the main public institutional player in the livestock sub-sector. Its mandate is to ensure the achievement and maintenance of self-sufficiency in animal products and by-products (including fisheries, apiculture and sericulture products). The Directorate (DAR) is headed by the Director of Animal Resources who is assisted by three Commissioners. The latter head the different departments, including Animal Production and Marketing, Livestock Health and Entomology, and Fisheries.

9.2 Dairy Development Authority (DDA)

Dairy Development Authority is a statutory body established by the Dairy Industry Act, 1998 with a mandate to develop and regulate Uganda's dairy industry. The objective of the Authority (DDA) is to provide proper coordination and efficient implementation of all government policies, which are designed to achieve and maintain self-sufficiency in the production of milk in Uganda. The Authority promotes production and competition in the dairy industry and monitors the market for milk and milk products. DDA has a Board of Directors constituted by representatives of dairy farmers, dairy cooperatives, dairy processing companies, Uganda Veterinary Association, dairy traders, MAAIF and the Ministry of Finance, Planning and Economic Development. The secretariat of the Authority was established in 2000.

The Authority developed a five-year strategic plan to address challenges in Uganda's dairy industry. The plan highlighted the actions that would be undertaken to achieve DDA's objectives. It described the major development and regulatory programs, support services and their outputs. Areas of focus included human resource development, policy and planning, research and development, quality assurance, dairy financing and the regulatory framework. With support from FAO, the dairy sector strategic plan is being revised. DDA is responsible for implementing "The Dairy (Marketing and Processing of Milk and Milk Products) Regulations, 2003". This has enabled DDA to implement a number of reforms in the handling and marketing of milk. This has resulted in a significant improvement in the

quality and safety of milk and milk products on the Ugandan market, as well as improved market access for smallholder farmers, increased milk production and productivity at farm level and better access to livestock services. All these developments are expected to translate into increase household income for dairy farmers in Uganda.

9.3 National Animal Genetic Resources Centre and Data Bank (NAGRC & DB)

The National Animal Genetic Resources Centre and Data Bank (NAGRC) was The Animal Breeding Act, 2001. The mandate of NAGRC & DB is to promote, regulate and control as well as, import, export and market animal genetic material, including quality assurance. The organisation is responsible for overseeing a transition from the mainly public delivery of AI services to commercial private sector led delivery. The NAGRC & DB retained all the functions of its predecessor institution, the Animal Breeding Centre including importation of semen, ova, embryos and AI equipment, training of AI technicians and facilitating administration of field AI services as the private sector assumes an increasing role in provision of artificial breeding service.

Under the new animal breeding policy, government allowed private sector operators to import semen and AI equipment and to provide field AI services. Among the active private sector operators that facilitate or support the training of AI technicians and provision of field AI services are World Wide Sire Inc., African Breeders Service, Heifer International, Send A Cow Uganda, BRAC, Church of Uganda and several other charity organisations.

9.4 National Agricultural Advisory Services (NAADS)

Until 2001 when government established the National Agricultural Advisory Services (NAADS) by an Act of Parliament, agricultural extension services were being provided almost entirely by government extension workers. The National Agricultural Advisory Services (NAADS) is a government agency mandated to implement a transition from the public funded to private sector funded agricultural advisory services.

9.5 National Agricultural Research organisation (NARO)

NARO is a semi-autonomous public sector national agricultural research organization, established in 1990 by an act of parliament. The main objective of NARO is to undertake, promote and coordinate research on all aspects of crop, livestock, fisheries and forestry. NARO is the apex body that coordinates the National Agricultural Research System (NARS). The latter means a cross section of stakeholders involved in the provision of agricultural research services whether in public or private sector; and comprises of NARO itself, all public agricultural research institutes, universities and other tertiary institutions, farmer groups, civil society organizations, the private sector and any other entity. NARO is the coordinating apex body of the NARS. It comprises of the **council** (governing body), three standing **committees** (technical arms), and the **secretariat** (management). It formulates policies, decides research strategy, sets priorities, allocates funds (between block grants & competitive funds), coordinates and monitors research providers and research programmes. The council also appoints the Directors of public agricultural research institutes.

9.6 Uganda National Bureau of Standards (UNBS)

Uganda National Bureau of Standards (UNBS) is a statutory body established by an Act of Parliament in June 1983 and became operational in 1989. The mandate of UNBS is to develop and promote standards, quality assurance, laboratory testing and metrology. The role of UNBS is to:

- Formulate and promote the use of standards;
- Enforce standards in protection of the public health and safety and the environment against dangerous, counterfeit and substandard products;
- Ensure fairness in trade and precision in industry through reliable measurement systems;
- Strengthen Uganda 's economy by enhancing competitiveness of local industries and promotion of quality exports through standardisation, quality assurance, testing and metrology.

UNBS collaborates with DDA to formulate and review national dairy standards. The two institutions also developed the **code of hygienic practice for milk and milk products**. UNBS and DDA participated in the regional efforts to develop harmonised East African Community standards for milk and milk products. UNBS continues to guide and assist dairy processing companies to implement Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Points (HACCP) and to comply with the requirements for International Standards Organisation (ISO) certification.

9.7 Uganda Bureau of Statistic (UBOS)

Uganda Bureau of Statistics (UBOS) was established by an Act of Parliament in 1998 as a semi-autonomous government agency responsible for coordinating, monitoring and supervising the National Statistical System. UBOS carries out data collection and analysis as well as information dissemination as part of its functions. Any other institution that wishes to collect, analyse and publish statistics that must be considered to be official must coordinate and liaise with UBOS which is the official institution responsible for the collection, processing and publication of statistical information. UBOS in collaboration with the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) regularly collects and analyzes data on the livestock industry and publishes the findings. In 2008, UBOS and MAAIF carried out a national livestock census. Results published in 2009 the most up to date official statistics on the livestock industry.

9.8 Other Important Institutions

Other important institutions whose activities shape the development of Uganda’s dairy industry include Makerere University which trains veterinary surgeons, animal production scientists, food scientists, agriculturalists, and agricultural engineers among others; Africa Institute for Strategic Animal Resource Services and Development (AFRISA); Bukalasa Agricultural College; Uganda Industrial Research Institute (UIRI); National Drug Authority (NDA), Uganda Investment Authority and Uganda Veterinary Association (UVA).

Chapter 10

10. DAIRY SECTOR CONSTRAINTS /CHALLENGES

The major dairy sector constraints/ challenges are related to increasing production and productivity, improving access to input and out markets as well as the providing an enabling environment.

10.1 Market Access Constraints

The eastern, mid-western, northern and Karamoja regions lack the necessary infrastructure to support organised milk bulking and marketing. Most farmers market their milk individually through the informal market. Poor milking and milk handling practices adversely affect the quality of marketed milk. The use of plastic milk receptacles, particularly jerry cans to store and transport milk is very common and continues to adversely affect the quality of marketed milk. Many farmers and milk vendors in the informal market add water to the milk for sale.

The infrastructure for milk bulking and chilling in the central region is also not well developed. Many farmers continue to sell their milk through the informal market. The number of milk cooling plants in the region was quite small until recently when development partners particularly Heifer International/ East Africa Dairy Development Project began to assist registered farmer groups to set up their own milk cooling plants. Sameer Agriculture and Livestock Ltd, the largest milk processor also assists farmer groups to set up milk cooling plants by providing the necessary equipment on rent basis. Since 2008, the volume of milk entering the formal market in the central region has been increasing steadily. The two major milk processing companies namely Sameer Agriculture and Livestock Ltd and Jesa Farm Dairy current purchase a significant volume of milk from producer groups in the central region.

The south western region produces a significant surplus of marketable milk particularly in the wet season. The region has well developed infrastructure for milk bulking and transportation. Most farmers are organized in cooperatives and market their milk through the cooperative structure. One of the major challenges facing producers in the south western region is the unreliable milk market and the low producer price for milk. In the wet season, the farm gate price for milk is generally low, ranging between UGX 200 and 350 per litre. Many farmers in the remote areas or areas that cannot be easily accessed in the wet season owing to the poor state of roads are not able to market all the milk they produce. In order to address the problem of surplus milk, particularly in the wet season, dairy farmers in south western Uganda through their umbrella organization, Uganda Crane Creameries Cooperative Unions (UCCCU) raised capital which they are using to set up a milk processing plant which will be able to process at least 50,000 litres of milk per day.

10.2 Low Milk Production and Productivity

The low productivity of dairy animals is a major challenge in all regions. The average milk yields of both improved and indigenous cattle are quite low. This is partly attributed to the poor quality of genetics and the poor feeding and farm management practices. A large percentage of dairy farmers in all regions do not conserve forage for feeding dairy animals particularly in the dry season. Most farmers depend entirely on rain-fed, natural pastures. The quantity and quality of pastures decline rapidly as the dry season progresses. All regions are experiencing a gradual decline in the average size of available grazing land and fertility of soils. All these factors contribute to limited supply and quality of pastures. Only a small number of households keeping improved dairy animals plant improved pasture/fodders species, although in most cases the acreage and productivity of the pastures do not meet the annual feed requirements of the farm.

Most farming households keep indigenous breeds, which are multi-purpose and produce low milk yields, averaging 1-3 litres per cow per day. A previous study of milk production of the Ankole cow, one of the most popular indigenous breeds showed that the average milk production was 325 litres in an average lactation length of 221 days. (http://www.fao.org/docrep/007/y5303t/y5303t03.htm). A similar study done earlier (Manson and Maule, 1960) indicated that the average milk production of the Ankole cow was 302 litres in a lactation length of 212 days. Even the improved dairy cows on most farms produce low milk yields. This is partly attributed to the poor feeding practices and quality of genetics. Most dairy animals sold on the market are of unknown pedigree and their production performance is below average. Many farmers who wish to improve the productivity of their farms cannot readily source good dairy breeding stock because most dairy farming households do not maintain accurate and up-to-date breeding records.

Artificial insemination (AI) is a very useful technology for improving the genetic potential of indigenous breeds through cross breeding. However, many dairy farmers are not able to access and utilise owing to lack of trained service providers in their areas. In areas where the service is readily accessible, the technology is thought to be inefficient because many animals are inseminated several times before conception. The price is also considered to be high, further hindering uptake of the technology.

Many districts in the traditional cattle corridor which extends from south western to north eastern Uganda frequently experience severe drought conditions often resulting in death of animals due to lack of water and pastures. Diseases of cattle particularly tick borne diseases and trypanosomosis remain a major hindrance to the adoption and management of improved dairy cattle in many areas. Resource-poor farmers fear to acquire exotic dairy cattle because of the high management costs. This is often compounded by poor access to reliable veterinary service providers in many potential dairying areas.

10.3 Limited Access to Livestock Support Services and Inputs

Access to good quality production inputs, livestock support services, particularly animal health, breeding and financial services is still a major challenge in almost all regions of Uganda. Many farmers do not have enough funds to invest in improved dairy technologies

such as improved dairy cattle, farm structures, artificial breeding, pasture improvement, as well as farm equipment and machinery. They are reluctant to borrow money from banks and micro finance institutions because of the unfavorable terms of lending, particularly the high interest rates and short repayment periods.

Other constraints to dairying include poor access to information, limited opportunities to improve technical and managerial skills, and the limited number of trained human resource at different levels of the commodity chain. Dairy farmers in rural areas have limited access to information and are not able to access and fully exploit lucrative markets opportunities as well as the necessary business development services.

10.4 Growing Shortage of Land and Labour

Shortage of grazing land is becoming a serious constraint to dairy farming in most regions of Uganda. The human population has been increasing rapidly, resulting in increased demand and competition for arable land. Households give priority to production of food crops. Hence, land available for grazing is steadily dwindling in most regions. Extensive grazing of cattle, which has always been the most common management system is steadily becoming less popular except in the traditional cattle corridor.

The growing shortage and high cost of labour is steadily becoming a serious challenge in the dairy sector. Many potential workers prefer to relocate to urban areas where they are mainly engaged in informal, less labour-intensive and probably better paying jobs.

A previous study (K2-Consult, 2001) reported that inadequate labour for carrying out different farm activities was a major constraint affecting production. In the eastern region (zero grazing and fenced farms), central-peri-urban (fenced farms), central-rural (free-range), and northern (communal grazing), labour expenses accounted for the largest share of the total variable costs farmers incurred. For instance, in eastern region, the costs attributed to labour ranged between 27.5% and 33% of total variable costs under zero grazing system and as high as 41.8-68.4% in the northern region under communal grazing system. In western Uganda, however, where animals were mainly grazed in fenced paddocks rather than herded, labour expenses were not as important as other costs except in medium fenced farms where the share of labour cost to total costs was about 57%. In the central region, labour was both very costly and not readily available. This could be attributed to existence of better employment opportunities.

10.5 Insecurity in Karamoja Region

Karamoja is a very unique region in terms of socio-economic development, cultural, security and agro-ecological factors. The region faces fairly unique dairy sector challenges/ constraints. The practice of raiding cattle (rustling) is regarded as a major cause of insecurity by Karimojong communities. During cattle raiding operations, large herds of cattle are forcefully taken away from their owners and moved over long distances to other locations by the warriors. Owing to the constant fear of losing cattle to raiders, many households avoid restocking and even sell off the remaining cattle. This has led to gradual decline in

herd sizes and milk production. Trekking of cattle over long distances causes a lot of physical stress to the animals and adversely affects milk production. Although the practice of cattle rustling is steadily declining, it has contributed to a severe decline in the volume of milk produced and consumed in the region.

Milk is one of the staple foods in Karimojong region. Shortage of milk in the region has led to serious food and nutrition insecurity. Many communities continue to depend on food handouts from World Food Programme (WFP) and other charity organisations.

Insecurity also affects the grazing patterns in Karamoja region. The traditional grazing grounds cannot be accessed because of insecurity or fear of cattle rustling. The relatively secure grazing areas are overgrazed. Obvious signs of soil erosion such as bear grounds and numerous galleys are noticeable in many areas and may be largely attributed to overgrazing.

10.6 Prolonged Drought in Karamoja Region

Each year Karamoja region receives a few months of rainfall. Prolonged drought is a frequent phenomenon. The main effects of prolonged drought include lack of pastures, lack of water for livestock and people, death of animals, reduced milk yields, lack of food for people and reduced household income among others. People and animals share watering points which quickly get depleted.
A number of interventions to address the above challenges have been recommended.

- Development of more reliable water sources such as valley dams and tanks for livestock within or near the grazing areas and wind mills near Manyattas for supply of portable water to communities
- Introduction of drought resistant pasture species and promoting pasture improvement practices (re-seeding of rangelands, control of weeds and invasive species, pilot demonstration gardens of improved pasture species, pasture harvesting and storage technologies, tree planting, fencing and paddocking)
- Introduction and promotion of early maturing locally acceptable food crop varieties. Promotion of good grain/cereal storage and post harvest handling practices to minimize losses
- Sensitise and involve communities in promoting the transition from communal grazing practices to private pasture development

Chapter 11

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

Uganda has a huge potential to produce enough milk to meet the domestic demand and export a significant surplus to regional and international markets. Uganda's major comparative advantage lies in the favorable production environment and the strategic geographical location within the heart of Africa. Uganda has a huge natural resource base comprising of abundant agricultural land, generally fertile soils, and a favorable climate. The two major rain seasons ensure adequate supply of pastures and production of milk almost throughout the year. Uganda's strategic location in the heart of sub-Saharan Africa is conducive for regional trade. It offers Uganda tremendous market access opportunities within EAC and the wider COMESA sub-region

Despite the fact that dairy production in Uganda is predominantly based on traditional smallholder production systems, Uganda is one of the major dairy producing countries in Africa. It is one of the few African countries that have attained 100% self-sufficiency in the production of milk (Hemme et al., 2007; FAO, 2010). The traditional pasture based low-input low-output production system which is the predominant management system makes Uganda one of the few countries in the world that are low cost producers of milk (Hemme et al., 2007).

One of the major challenges to Uganda's dairy industry is the dominant traditional, smallholder production system and informal market. More than 90% of the milk is produced by smallholders. The main features of the traditional smallholder production system in Uganda include the small herd sizes, low animal productivity, small land holdings, and greater dependency on family labour and the informal market. It is also characterized by the multi-objective nature of farmer behaviour, low-input low-output levels and nutrient deficiency at both farm and household level. This system of production does not provide a strong foundation for rapid economic prosperity through commercialisation of dairying at both household and national level. Only a small number of farms are involved in serious commercial dairy farming. The infrastructure for rural milk collection and transportation is not well developed in most parts of the country except south western Uganda. This is still a challenge to commercial dairy production and access to reliable markets.

Dairying could play a greater role in the economy, owing to its strong potential to provide rural employment opportunities and regular income to resource poor households. There is a huge potential to increase dairy production and productivity if adequate attention is paid to promoting access to markets, production inputs, improved dairy technologies and efficient advisory and business development services particularly animal health, breeding, finance and marketing infrastructure. In general, all regions of Uganda experience difficulties in accessing reliable milk markets because of the poor state of rural feeder roads, particularly in the wet season. Many areas that produce a lot of milk are virtually inaccessible in the wet season because of the impassable feeder roads.

11.2 Recommendations

11.2.1 Improving market access and milk consumption

All efforts to develop Uganda's dairy industry should give priority to addressing market access constraints and promoting the consumption of milk and dairy products. A vibrant market will effectively drive production through a strong pull effect that will stimulate adoption and utilization of improved dairy technologies in order to increase farm level production and productivity.

i) In order to improve market access for smallholder farmers, the public and private sector including dairy sector NGOs and development partners should collaborate to support and facilitate improvement of the infrastructure for rural milk collection, bulking and transportation.

ii) Government and the private sector, especially dairy sector NGOs should support and facilitate mobilization of milk producers to form strong, well-managed member-based organizations that have the capacity to set up and efficiently manage rural milk bulking and chilling facilities and undertake collective marketing.

iii) The private sector should collaborate with government, development partners and NGOs to mobilize resources for implementing a campaign to promote the consumption of milk and dairy products.

iv) Training producers and market agents on hygienic milk production and handling, facilitating acquisition of appropriate milk handling equipment and linking producer marketing organizations to reliable markets will help to address the widespread market access constraints.

11.2.2 Increasing milk production and productivity

Uganda's dairy industry requires a lot of support to address the challenge of low milk production and productivity of dairy animals. Most dairy farming households rely on natural pastures. In some parts of Uganda, there is shortage of grazing land yet farmers do not produce and conserve fodder. As a result, animals do not have access to enough fodder particularly in the dry season. In order to improve the production and productivity of dairy animals, the following interventions are recommended:

i) Training of dairy farmers on management of dairy animals, as well as production and conservation of fodder for dry season feeding
ii) Promoting access to improved feeds and feeding technologies
iii) Promoting access to improved dairy breeds and breeding technologies
iv) Development of water sources at both farm and community level, including promotion of rain water harvesting technologies

11.2.3 Peace and security in Karamoja region

i) It is recommended to promote dialogue, peace building initiatives and signing of peace agreements amongst worrying pastoralist communities in Karamoja region as a means of enhancing peaceful co-existence and sharing of communal resources such as grazing land and livestock watering points.

ii) The government, development agencies/NGOs and CBO are urged to support community development activities that engage the youth and worriers in gainful employment and community development initiatives.

11.2.4 Implementation of regulations

i) DDA is urged to strengthen the implementation of dairy sector regulations and standards in all regions. It is recommended to collaborate with organizations of dairy stakeholders such as producers, traders and processors in order to strengthen DDA's capacity to implement the regulations in a sustainable and cost efficient manner.

ii) Government should provide targeted incentives to the major wholesalers of raw milk in order to encourage and facilitate their transformation from the current semi-formal raw milk value chain to a fully formal, processed milk value chain. The aim of the incentives is to enable the bulk raw milk wholesalers to acquire and set up the necessary infrastructure for milk processing and packaging and to establish an elaborate distribution network for fairly priced processed milk.

11.2.5 Dairy sector information management system

i) The dairy industry urgently requires a reliable source of up-to-date industry statistics. Dairy Development Authority should collaborate with the private sector, development partners and NGOs to find a sustainable mechanism of collecting non-proprietary dairy industry data. Dairy companies should be encouraged to willingly and regularly submit data on their milk collection, transportation, processing and marketing operations in order to accurately monitor progress and performance of Uganda's dairy industry. It might be necessary to set up a comprehensive on-line dairy industry database and information resource centre that can be accessed by dairy companies to submit data online.

ii) It is recommended to set up affordable and sustainable rural information management systems which will enable dairy farmers and other stakeholders to easily access up-to-date information on dairy input and output markets. In -areas such as Karamoja where there is a high rate of illiteracy, information systems based on radio broadcast and probably mobile telephony could be more user-friendly and easier to implement than those based on computers and the internet.

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