FAO Prevention of Food Losses Programme

Milk and Dairy Products, Post-harvest Losses and Food Safety in Sub-Saharan Africa and the Near East.



A Review Of The Small Scale Dairy Sector – Uganda

Dr. Florence N. Masembe Kasirye June 2003

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Acronyms

ADB	African Development Bank
СВО	Community Based Organization
CEF	Common External Tariff
COMESA	Common Market for Eastern and Southern Africa
DANIDA	Danish International Development Agency
DC	Dairy Corporation
DDC	Dairy Development Committee
DCL	Dairy Corporation Limited
DDA	Dairy Development Authority
DDC	Dairy Development Committee
DI	Dairy Industry
EAC	East African Community
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GMP	Good Manufacturing Practice
GOU	Government of Uganda
HACCP	Hazard Analysis and Critical Control Program
HPI	Heifer Project International
ILRI	International Livestock Research Institute
LOL	Land 'O' Lakes
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MCC	Milk Collecting Center
NAADS	National Agricultural Advisory Service
NAGRC & DB	National Animal Genetic Resources Center and Data Bank
NARO	National Agricultural Research Organization
NGO	Non-Governmental Organization
PMA	Plan for Modernization of Agriculture
SAC	Send a Cow
SWOT	Strengths, Weaknesses, Opportunities and Threats
UEPB	Uganda Export Promotion Board
UDISA	Uganda Dairy Industry Stakeholders Association
UHT	Ultra Heat Treatment
UIA	Uganda Investment Authority
NAADS	National Agricultural Advisory Services
UNBS	Uganda National Bureau of Standards
UNDAFA	Uganda National Dairy Farmers Association
UNDATA	Uganda National Dairy Traders Association
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Organization
USA	United States of America
USAID	United States Agency for International Development
WFP	World Food Program
WWS	World Wide Sires
YWCA	Young Women's Christian Association

Executive Summary

In Uganda the livestock sub-sector contributes 17% to 19% of the agricultural GDP and 7 to 9% of the National GDP. Of the livestock GDP, the dairy industry is estimated to contribute 40 to 50%. It is estimated that mixed farming smallholders and pastoralists together own over 90% of the national cattle herd, with dairying as an integral part of the agricultural system in most parts of the country.

While traditional dairy farmers in Uganda do not categorically fall in the poorest segment of the farming community, the industry is overwhelmingly based on smallholder farmers, with animals ranging from 1 to 40 in number. The sale of milk is the major and often only source of regular income for the vast majority of these smallholders. Many smallholder milk producers supply large-scale processors (formal market), as well as a large number of small market traders known as vendors (informal market), who sell raw milk in urban and peri urban areas.

The formal and informal markets constitute the two main channels of marketing milk and milk products in Uganda, with the informal commanding nearly three quarters of the market. It is the major avenue for marketing milk and a threat to the formal market, which mainly consists of processors. However, some of the processed milk is exported to the regional markets (Kenya & Rwanda).

The history of the dairy industry of Uganda dates back to the sixties when the post independence governments started stocking exotic dairy breeds through a number of projects in order to increase milk production. The first Dairy Industry Act of 1967 set up Dairy Corporation as the government body responsible for development, marketing and regulating the industry. In 1993, the Government of Uganda with assistance from DANIDA developed "A Master Plan for the Dairy Sector" with three major recommendations; that milk marketing should be liberalized, a Dairy Board be created to oversee the liberalized industry and that Dairy Corporation should be privatized. Thus the Dairy Industry Act 1998 created the Dairy Development Authority (DDA) and a purely commercial company the Dairy Corporation Ltd (DCL). The DDA took over the development and regulatory functions of the dairy industry and DCL is to be divested. Preparations for the divestiture are in advanced stages.

As a result of liberalization of the market other players joined the market and there are currently nine (9) large-scale processors. The government also put in place strategies for development of support services like extension and breeding. In addition, government is encouraging the revival of co-operative societies as well as promoting the export drive.

Total national milk production has grown from an estimated 365 million liters in 1991 to 900 million liters in 2001 with the main milk production areas in the southwest contributing 38.2%. Milk losses are a major constraint affecting the efficiency of production in Uganda. This is largely attributed to marketing constraints. Overall the major cause of milk losses is limited demand for milk mainly attributed to the low purchasing power. Losses are highest during the flush (rainy) season. It is estimated that up to 50% of milk produced during the rainy season is left at the farm unsold. In the formal milk market however, very little milk is lost. However, loses in the informal sector although not documented are likely to be very high. This is probably due to the mishandling and adulteration practices rampant in this sector.

Average national per capita consumption of fresh milk is 40 liters (2001 estimate). In Uganda, the most commonly consumed types of milk are unprocessed raw milk, domestically

processed packaged milk (pasteurized and UHT) and boiled unpackaged milk. Dairy products consumed include: yogurt, and indigenous fermented milks, ghee, butter, cheese, ice cream, sweet and sour cream. Unprocessed milk marketed through the informal channels has the highest demand followed by processed packaged milk. Income level is an important determinant of milk and dairy products consumption and higher per capita milk consumption is observed in well-to-do households. Other influencing factors include nutritive value, cultural, proximity to milk distribution outlets, taste and preference.

Level and extent of public health risks posed by milk and dairy products is experienced right from the farm and throughout the dairy chain. Cooling facilities required throughout the chain to assist in reduction of levels of contamination and bacteria multiplication are greatly lacking. High levels of post harvest contamination have been documented. Training of personnel at all levels in standard hygienic practices; GMP, HACCP and processing technique can minimize these.

The Dairy Development Authority is mandated by an Act of Parliament to pool dairy processing and marketing data. However, the authority is taking the initiative to establish a comprehensive database for the entire dairy industry. This is expected to serve as an all round source of data and information for all stakeholders in the dairy sector. The Authority is also establishing a library of information for the dairy sector.

In the future, small-scale dairy farmers and organizations have a potential role in the development of a sustainable dairy sector designed to meet current and future consumer needs through a number of strategies as outlined in this report.

Poverty and weak purchasing power prevails in the country. For most consumers, choice of the product is dictated by price not quality. There is need therefore to explore use of low-cost production, processing and packaging alternatives that can be afforded by the majority of the population. At the production level, appropriate stocking rates should be encouraged to avoid environmental degradation. Government, NGOs and development partners should assist in the construction of valley dams along the 'cattle corridor', to minimize on environmental degradation resulting in overcrowding of livestock in one area.

Promotion of small-scale rural based dairy processing plants should be supported. This will help in prolonging the shelf life of milk. However, due to lack of capital to invest in new cheap technologies, milk bulking, hauling and/or processing facilities near areas where comparative advantage exists should be promoted.

Use of low-cost processing plants with designs that increase flexibility & allow maximum utilisation of resources should be encouraged. Poor plant and processing design leading to cost-inefficient production has to be addressed.

There is need to train stakeholders at various levels to create a harmoniously operating system along the entire chain from primary production to consumption. The inadequate management capacity in the dairy sector needs to be addressed. In order to address the poor quality of raw milk there is need to integrate quality assurance across the entire production chain. Training of personnel in GMP at all levels of the chain should be encouraged.

There is need to qualify and quantify the post harvest loss in the dairy sector. A baseline study to assess the situation would therefore be very useful in understanding the causes as well as formulating interventions where necessary.

Most small-scale operators and to a large extent the large-scale processors operate with very little capital and have no access to reasonably cheap credit facilities. Government and NGOs should consider availing credit facilities for to the above-mentioned because they are instrumental for the implementation of PMA in relation to the dairy sub-sector.

Very few market studies have been undertaken in the dairy industry. There is a need to conduct periodic market surveys to quantify and qualify consumer demand, required packaging and affordable price. There has been very little promotion of milk consumption by the dairy processing companies leaving the consumption-playfield to substitute products like juices. DDA and the private sector should link with the relevant Government ministries to prepare and launch campaigns to educate consumers on the benefits of consuming milk and the various dairy products.

1. Introduction

The agricultural sector is vital the economic development in Uganda and its contribution to national food self-sufficiency and food security cannot be overemphasized. Agriculture accounts for over 40% of GDP and more than 90% of export earnings. Furthermore, it contributes over 60% of total revenue and employs more than 80% of the total labour force, providing half of total income for the poorest three-quarters of the population.

The livestock sub-sector contributes 17% to 19% of the agricultural GDP and 7 to 9% of the National GDP. Of the livestock GDP, the dairy industry is estimated to contribute 40 to 50%. It is estimated that mixed farming smallholders and pastoralists together own over 90% of the national cattle herd, with dairying as an integral part of the agricultural system of most parts of the country.

While traditional dairy farmers in Uganda do not categorically fall in the poorest segment of the farming community, the industry is overwhelmingly based on smallholder farmers, with animals ranging from 1 to 40 in number. These are low-income groups pursuing a subsistence agricultural activity. In the past 15 years, a number of heifer projects have made a big impact on the dairy industry by the various interventions that have addressed problems of the poorest of the poor.

Under the Plan for Modernisation of Agriculture (PMA), the small-scale dairy sub-sector is encouraged to produce milk on a commercial scale as a source of the much-needed income. This will impact on the rural community especially women, who are directly involved in household milk production, processing and marketing, thus contributing to poverty alleviation. The sale of milk is the major and often only source of regular income for the vast majority of these smallholders. Many smallholder milk producers supply the new processors (formal market), as well as a large number of small market traders also know as vendors (informal market), who sell raw milk in urban and peri-urban areas.

The formal and informal markets constitute the two main channels of marketing milk and milk products in Uganda, with the informal commanding nearly three quarters of the market. It is the major avenue for marketing milk and a threat to the formal market. At the moment, the Dairy Development Authority is addressing the problems of this sector. The formal market on the other hand mainly consists of processors with the majority having MCCs situated in the milk producing areas. Uganda at the moment has nine (9) major processors who mainly pasteurize and pack the milk under strict quality control, though other dairy products are produced on a small scale. After processing, the products are distributed to their retail outlets using delivery vans.

There is a potential domestic market for milk and dairy products in Uganda and a real potential for export to neighbouring countries because of the genuine comparative advantage in dairy production in that it is endowed with good edaphic, climatic, and biotic factors. Some of the processed milk is exported to the regional markets mainly Rwanda, Kenya and Tanzania. The milk export earnings were estimated at US \$3 million in 2001 although this is expected to drop because of restrictions in the Kenyan and Rwandan markets.

2. History of Government and Private Sector Involvement - Developments over the Last 30 Years

Milk production in this country is mainly from indigenous cattle. To increase production of milk, the post independence government in the sixties started state owned stock farms through which exotic dairy breeds (Friesian, Guernsey, Jersey and Ayrshire) were introduced into the country. By 1965, milk production had increased to levels that needed effective regulation and co-ordination of development activities. In 1967, the first Dairy Industry Act was enacted, and the Dairy Corporation a fully financed and operated parastatal was established by the state. It was charged with the role of collection, processing and marketing all the milk. In addition, it was responsible for the regulation and development of the dairy industry. Milk collection reached its peak in the 70's with 19 million liters collected in 1972, and per Capita consumption of 40 liters. However, following the trend typical of that period, the industry rapidly deteriorated such that by 1985, the Dairy Corporation was hardly operational and could not collect more than 200,000 liters a year.

During the 80's, Uganda benefited from an African Development Bank loan, which was used for re-stocking with improved breeds from Zimbabwe and Holland. Part of this loan was also used for rehabilitation of three government farms namely: Njeru, Nshara and Rubona. The first Heifer project commenced in 1984 with animals from the United States of America (USA) and the project targeted the rural poor especially women. The project worked in such a way that the beneficiary would get a heifer and then pass on the first female offspring to the next person. Other dairy projects during the 80's include that of YWCA and Send a Cow (SAC), which are operating to date.

The restoration of peace in 1986 was followed by massive importation of dairy cattle and credit lines were availed to farmers, mainly by USAID and ADB, through the Uganda Commercial Bank. The restocking with the imported dairy cattle was mainly in the Central, Eastern and Western regions, which forms the traditional milk-shed area.

From 1986 to 1993 a multi-donor program, the UGA/84/023 Dairy Industry Development project, led by the then parastatal Dairy Corporation and the Food and Agriculture Organization (FAO) supported by ADB, DANIDA, the United Nations Development Program (UNDP) and the World Food Program (WFP) completed the first phase of the national dairy rehabilitation and development program. By 1990, milk collection was restored to the 1970s peak level and by 1993 it had reached around 26 million liters per annum.

During the period 1981-1988, WFP provided Uganda with skimmed milk powder and butter oil worth US \$ 26.6 million for recombination purposes. The intention was that the revenue from the sale of these commodities be used to develop the domestic dairy industry. The money was put to good use and over 80 milk-collecting centers (MCCs) were made operational, either by rehabilitation or establishment of new ones. Most of the rehabilitated centers were in the peace-prevailing areas; that is East, West, and Central Uganda especially the Southwestern region (also known as Mbarara Milk-shed). The DC Kampala and Entebbe plants were also rehabilitated and ten (10) marketing groups were formed. For the period 1989-1993 WFP approved a project with the intended target to deliver skimmed milk powder and butter oil to the value of US \$ 29 million. However, because of the rapid increase in Dairy Corporation's collection of fresh milk, it is estimated that only about 18% of this target was delivered. The skimmed milk powder and butter oil commodities were supplied to Dairy Corporation who paid for them an official producer price for milk, less 10%, to allow for the extra costs of recombining. This pricing was attractive to DC, as it did not have any collection costs. The payments so made were then paid to the Dairy Development Committee (DDC), which was set up in 1980 for the specific purpose of administering the funds generated. DDC's task also included identifying and funding worthy projects/organizations involved in dairy development activities.

Between 1987 and 1991, government made deliberate efforts to increase stock and imported approximately 2000 Friesian cattle from Germany and Holland under the Coffee Barter Trade deal and another 300 Friesian under the ADB loan. NGOs and farmers imported in the region of 1,000 heads of cattle, mainly from Europe and USA. The private sector has invested heavily in the dairy sector (see Table 1).

By 1990, the industry showed signs of good recovery and there was indeed need to reorganize it. In order to sustain the instituted rehabilitation programs, the Government of Uganda (GOU), with financial and technical assistance from DANIDA developed "A Master Plan for the Dairy Sector". In June 1993, government finally adopted the Master Plan. Three major recommendations were made in the plan, namely that:

- Milk marketing should be liberalized
- A Dairy Board should be created to over see the liberalized industry.
- Dairy Corporation should be restructured into a commercial company and divested.

As part of the Master Plan recommendations, the Dairy Industry Act 1998, which replaced the Dairy Industry Act 4 of 1967, was enacted by Parliament. The new Act provided for establishment of Dairy Development Authority (DDA) to take over the developmental and regulatory functions of Uganda's dairy industry. The same Act provided for the establishment of Dairy Corporation Ltd (DCL), which would assume the commercial role and later be divested.

The Dairy Development Authority, which became operational late in 2000, falls under the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). The objective of DDA is to provide proper coordination and efficient implementation of all government policies, which are designed to achieve and maintain self-sufficiency in production of milk in Uganda by promoting production and competition in the dairy industry and monitoring the market for milk and dairy products. In addition to this, the DDA facilitates the industry to raise the incomes and standard of living of small-scale farmers through increased and continuous returns in dairy farming; achieve and maintain self–sufficiency in milk and dairy products and to export any surplus; promote increased dairy productivity with the use of available cost effective technology and breeding policy and to foster its sustainability with due regard to cordial environment equilibrium; establish liberal but harmonized dairy markets and promote competition in milk collection, processing and marketing; regulate and control the market for milk and dairy products and to promote production and competition there in; and improve human resources capacity for the development of the dairy sector.

Preparations for the divestiture of DCL are in advanced stages. The liberalization of the dairy industry stimulated the emergence of 9 private processing companies (Text Box 1) hence creating employment for the people of Uganda. One of these and the government owned DCL are already participating in export of UHT milk to neighbouring countries.

Company	Location	Installed Capacity ('000 liters)
Alpha Dairies	Mbarara	50
Country Taste	Mbarara	30
Dairy Corporation	Kampala	130
GBK	Mbarara	90
Jesa Farm Dairy	Busunju	10
Kaisa Dairy	Kamuli	10
Sunshine Dairies	Kampala	10
Teso Dairies	Soroti	03
White Nile Dairies	Jinja	10
Total	-	343

However, the private sector is still very weak. The utilization capacity of all processing plants with the exception of Jesa Farm Dairy is below 30% and almost all companies have problems of funding and management. Efforts are being made by DDA to re-organize and rationalize the dairy industry through the following:

- a) Registering and licensing milk processors and traders.
- b) Supporting dairy farmer's marketing organizations.
- c) Registering dairy farmer's groups.
- d) Advising Government on milk standards in liaison with the Uganda National Bureau of Standards (UNBS).
- e) Controlling and regulating dairy related import and export activities in conformity with external Trade Act but without violating the animals Diseases Act.
- f) Implementing Government policies designed to promote the development of the dairy sector.
- g) Supporting various dairy development activities such as dairy extension, dairy breeding, research, dairy training, dairy products development and general market promotion including promotion of dairy export.
- h) Acting as arbitrator in any conflict between companies and processors.
- i) Coordinating all dairy processing and marketing, promotional activities such as seminars, trade fairs and workshops.
- j) Pooling dairy processing and marketing data.
- k) Advising Government on research priorities of the dairy sector.

In addition to efforts being made by DDA is the Uganda Private Sector Dairy Industry Development Activity, a 5.8 million dollar three year dairy project funded by USAID and being implemented by a consortium of partners including Land 'O' Lakes (LOL), Heifer Project International (HPI), and World Wide Sires (WWS). The current phase has specific objectives of leading to increases in on-farm productivity levels, dairy processing, domestic consumption of processed dairy products, volume of milk entering cold-storage/bulking system, availability of milk and milk products in the North and East parts of the country and increasing dairy exports. The previous project run by LOL trained beneficiaries in animal husbandry and how to manage their resources among other things.

Table 1: Private Se	ector In	vestment in the Dairy Indu	istry
Name	Since	Magnitude of Investment	Achievements
Land –O-Lakes	1994		See previous section
EDF Micro project	1993	Approx. 104 million Ushs	Distributed 100 in calf heifers
			Has recovered 10% of the loans
CARE International			
Uganda Red Cross	1992	Approx. Ushs 66.64 million	Distributed 44 in-calf heifers
Heifer Project International	1982	Approx. Ushs 2,101 million	Has distributed 1681 in-calf heifers
			Trained AI technicians
Send-A-Cow	1988	Approx. 600 million Ushs	Provided semen
			Provided 500 in-calf heifers
Bothar Ireland (The way of the	1991	Approx. 625 million Ushs	Provided 521 in calf heifers
cow)			
The Church of Uganda Livestock	1983	Approx. 993 million Ushs	Provided 820 in calf heifers
Improvement Program			Provided 15 dairy goats
			Increase milk and income
Uganda Catholic Secretariat	1987	236.55 million Ushs	Provided 290 in calf heifers
Dairy Project			114 Passovers
Bugusege Livestock Project	1989	Approx. 76 million Ushs	Distributed 60 in calf heifers
Bunyoro Kitara Diocese Heifer	1992	Approx. 65.8 million Ushs	Distributed 83 in calf heifers and 11
Project			Passovers
Kiyenje Dairy Co-operative	1985	Approx. 220.6 million Ushs	Distributed 169 in calf heifers and 89
Heifer Project			Passovers
YWCA Dairy Cattle Project	1984	Approx. 420 million Ushs	Provided 350 in calf heifers
			Has established a number of zero
			grazing clubs
Kisinga Women Dairy Goat	1991		Has provided 119 goats
Project			Project goats are a source for milk
			and breeding stock
Kirinya Women's Heifer Project	1993	Approx. 69 million Ushs	Distributed 58 in calf heifers
			Constructed a demonstration biogas
			plant. Has MCCs
YWCA Mbale Branch	1994		
G.B.K. Dairy	1994	Installed 40,000 lts/day	12,000 lts/day
Paramount (Kakoba)			
Ramilk	1995	2.0 M US\$	Has produced 20,000 litres of milk
			per day for xx years at $500/=$ per litre.
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~			Closed
Creameries UHT			
Western Highland	1995	100,000 lts/day	Closed

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Source: ILRI, The Ugandan Dairy Sub-sector – A Rapid Appraisal, 1996

3. The Process of Policy Making and Current Policy Framework

The current trend of making policies is participatory. The policy to be formulated is first conceived by the relevant ministry. The concerned stakeholders are identified and a multisectoral team is selected to spearhead the writing of the policy. The team normally includes a cross section of stakeholders as well as policy makers from the relevant Ministry. The team then consults widely and collects views from stakeholders at all levels right from the beginning. The draft is shared with the stakeholders for their comments and consensus building is encouraged.

After approval by the stakeholders, the draft is then forwarded to the relevant Minister who presents it to Cabinet for approval. The Minister then further forwards it to the Parliamentary subcommittee responsible for the sector. After discussions in this Committee, it is tabled in Parliament for debate. If there are any laws required to back the implementation of the policy, a bill is tabled in Parliament and this is discussed and passed at the same time as the policy.

The current policy frame work includes, liberalization, privatization, good governance, decentralization of power to the districts, restocking of livestock, private sector delivery of extension services, promotion of formation of co-operatives and promotion of strategic exports including dairy products within the East African region and beyond.

4. The Level and Extent of Current Policy Implementation

The dairy sector in Uganda has gone through a number of policy and institutional changes over the recent years. In 1967, the first Dairy Industry Act was enacted and this brought Dairy Corporation into existence as a government body. In the beginning, the Corporation performed well. However, between 1971 and 1986, the economy suffered greatly. This was attributed to civil strife, expulsion of the business oriented Asian community and the break-up of the then vibrant East African Community (EAC). In many parts of the country livestock numbers were reduced by cattle rustling, poor marketing support infrastructure, breakdown in animal health services and other important services.

Therefore, in 1986, the present government adopted an economic recovery program, which included a major dairy industry rehabilitation program co-ordinated by Dairy Corporation and FAO. With financial and technical assistance from DANIDA, "A Master Plan for the Dairy Sector" was developed in 1991 and in June 1993, the report was ready. The report had three major recommendations namely that:

- Milk marketing should be liberalized
- A Dairy Board should be created to over see the liberalized industry.
- Dairy Corporation should be restructured into a commercial company and divested.

As a result, the market was liberalized and Dairy Corporation ceased to be a monopoly since other players joined the market. At the moment there are nine large-scale milk processors. Dairy Corporation now called Dairy Corporation Limited (DCL) was left with only a commercial role and is soon to be privatized. DCL's roles of dairy development and regulation of the dairy industry were passed on to the newly created Dairy Development Authority. DDA was formed by the Dairy Industry Act of 1998 with the objective of providing proper co-ordination and efficient implementation of all policies designed to achieve and maintain self-sufficiency in the production of milk in Uganda.

The Dairy Master Plan has served DDA and the entire Dairy Industry quite well and continues to serve as a very useful reference point for all its activities. The Master Plan offers sufficient flexibility to accommodate strategic adjustments in circumstances and is therefore used as a planning and implementation guide and a coordination tool, where actual interventions are undertaken based on developments in the real environment and the needs of the dairy industry.

The DDA strategy aims at establishing a strong Authority to strengthen dairy development and regulation activities in Uganda. The strategy is to focus on the role and the objectives of DDA as stated in the Dairy Industry Act – 1998, the current challenges in the dairy industry in Uganda and the actions that must be taken to meet these challenges and achieve DDA's mandate.

The goal is to contribute to improved household income, nutrition and welfare especially of small-scale farmers through increased production, processing and marketing of milk and dairy products. The development objectives are to increase quantitative and qualitative production of milk and dairy products so as to meet national demands and export need; and to increase profitability of dairy farming by increasing productivity of livestock and improve marketing of milk and milk products by promoting liberalization and privatization in processing and marketing.

There are six major outputs of the DDA strategy, namely:

- 1. Improvement of milk production.
- 2. Improvement of quality of milk and dairy products.
- 3. Improvement of processing and marketing of milk and dairy products.
- 4. Strengthening linkages with various stakeholders and development.
- 5. Strengthening skills and knowledge of dairy stakeholders
- 6. Strengthening DDA.

Each of these outputs consists of a number of major elements which when considered together will allow the overall objective to be achieved.

It is anticipated that milk production will be improved through the following:

- Interventions for milk-deficit areas.
- Support to dairy stakeholders' Organizations.
- Data collection, processing, and dissemination on the dairy industry.

• Additional research in milk chain to address production constraints such as efficient utilization of existing feed resources.

The quality of milk & milk products will be improved through:

- Effective and efficient regulation
- Quality control laboratory established

Processing and marketing of milk and milk products will be improved through:

- Increased milk processing
- Improving domestic marketing of milk and milk products
- Promotion of milk and milk products exports

Linkages with various stakeholders in development at national and local government levels will be strengthened through development of strong and viable linkages. Skills, knowledge and modern affordable practices for dairy sector for stakeholders will be strengthened through the recent acquisition and rehabilitation of Entebbe Dairy Training School. This will be used for training of dairy industry stakeholders. The DDA intends to contract out the running of this school to a private firm. DDA's institutional capacity will be strengthened through improved governance and excellent resource (human, physical, financial & information) planning and management.

To attain the broad policy goals of self-sufficiency in dairy production, government has since 1986, taken the following measures: i) importing exotic heifers and pedigree bulls; (ii) restructuring and strengthening the national extension service through the NAADS program (iii) rehabilitating the national artificial insemination services (iv) restocking dairy farms to provide breeding stock for up-grading farmers cattle (v) committing financial and personnel resources to address identified problems in the production and marketing of milk; (vi) improving animal health services, including disease control, and (vii) regular policy reviews. These policy strategies recognized the need to involve private sector in production and marketing activities, while acknowledging the continuing contribution of the development partners to dairy development.

The process of turning extension into being demand driven, private sector provided and paid for by farmers has started. In this regard, government set up a National Agricultural Advisory Services (NAADS) with a secretariat to over see this change. At the moment, extension is to be privately provided but paid for by government. It is hoped that gradually the farmers' contribution of payment for the services will increase. The government also has strategies and policies for development of supportive services for in-put supplies such as credit access, health care and breeding services. These services are interdependent and efforts must be directed on all fronts for developing an efficient and self-sustaining dairy industry.

Since the late 1960's, successive governments have viewed co-operatives as an instrument extracting rural surplus to benefit the urban elite and partly a means of control. The co-operative movement thus, lost meaning to many farmers. However, government is now trying to have co-operatives revived. The first step in the revival was to revise the co-operative statute. Thus, in 1991, the co-operative statute was revised and the Co-operative Societies Statute came into force in September 1991. Under the revised Act, government involvement has been drastically trimmed in line with liberalization and privatization policies. The responsibility of supervising and auditing co-operatives has been transferred to Uganda Co-operatives Alliance, the peak organization for co-operatives and to the co-operative societies themselves. Farmers recognize the benefits of the co-operative approach, especially in marketing. In recent years, the number of informal farmers' associations has grown considerably. The DDA assisted dairy farmers in the formation of National Dairy Farmers Association (UNDFA), which was launched in September 2002 to over see the interests of only dairy farmers.

Government has identified several non-traditional export commodities, which it is supporting under the strategic export intervention. These include milk and dairy products. In addition, government is promoting regional co-operation and integration. This is mainly because regional co-operation and integration makes economies more viable and vibrant through the creation of larger markets for trade and investment. Uganda has been at the forefront in regional co-operation and integration efforts, especially in the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA).

Under COMESA, there is preferential treatment among 21 countries, which involves removing all taxes among certain commodities. Uganda has gradually removed its tariffs by 80% across the board. According to the agreement, it should be 100% reduction over the next two years. However, Uganda is targeting and encouraged to go to 0% tariffs by 2004.

The establishment of an East African Customs Union, Common External Tariff and Elimination of Internal Tariffs is being discussed. There is agreement to adopt a three-tariff rate band structure under the Common External Tariff (CET). Consensus has been achieved to adopt the rates of 0% (raw materials), 10% (intermediate goods) and 20% final products. However, Kenya and Tanzania have proposed to adjust the maximum CET from 20 to 25%. Consultation on this is still continuing.

The EAC region is also considering elimination of Internal Tariffs and there is agreement to adopt a program for the gradual elimination of internal tariffs. In this respect, there is understanding to have 3 categories of goods, namely:

Category A = Goods for immediate liberalization

Category B= Goods for gradual liberalization

Category C= Goods for permanent exclusion because of international conventions.

Other pertinent issues under consideration at the EAC level include:

- Trade between Uganda and Tanzania shall be duty free.
- Ugandan and Tanzanian goods on the Kenyan market shall be duty free.
- A selected list of goods from Kenya on the Ugandan and Tanzanian market (category B) shall be subject to an interim duty rate during a transitional period of phase out. Uganda's list includes milk and dairy products at a duty rate of 10%.

5. Institutions and Their Role in Terms of Policy, Organizational Structure, Mandate and Activities in the Dairy Sector

The development of a viable commercial dairy industry requires specialized support services to raise productivity and returns to smallholder dairying. The support services required to enable farmers to profitably and sustainably engage in dairy production include: (i) a stable market (ii) in-put supplies e.g. credit, health care, breeding services (iii) technical support e.g. adaptive research, extension, and (iv) supportive policies such as those relating to regulations, insurance, institution building amongst others.

The participation of several development partners in the dairy sector has been recognized. Subsequently Government and DDA collaborate with several relevant institutions.

Uganda National Bureau of Standards: Responsible for setting the national standards for products and their enforcement. For the dairy sector, DDA advise UNBS on standards to be developed, participates in the development and co-ordinates the enforcement with them.

United Nations Industrial Development Organization: Is one of the stakeholders involved in training in the dairy industry. It has an Integrated Support Program formulated in 1999 to overcome the challenges facing the manufacturing sector. Its food industry sub-component focuses on:

- The export oriented industries to increase their competitiveness through introducing upgraded and clean processing technologies and establishing a reliable food safety and quality assurance system, which meets the international market requirements.
- The micro and small-scale food processing operators to reduce post harvest losses increase the income of the rural population (mainly women) and strengthen linkages between agriculture and industry.

National Animal Genetic Resources Center and Data Bank (NAGRC & DB): This organization is the custodian of the animal breeding policy. It is responsible for implementing of all government policies related to animal breeding in Uganda, including artificial insemination.

Uganda Police Force: The police are used in the enforcement of regulations in the dairy sector. During the phasing out of use of un-hygienic plastic jerry cans as milk vessels (a norm in the informal market) for the hygienic stainless steel cans, the police had to come in.

National Agricultural Research Organization (NARO): Is a national body that was established in 1992 with a statutory mandate to undertake, promote and co-ordinate research in all aspects of crops, fisheries, forestry and livestock and to ensure that the dissemination and application of research results.

Ministry of Agriculture, Animal Industry and Fisheries (MAAIF): This is the parent ministry of the dairy sector which designs all government policies aimed at promoting development in the dairy sector.

Uganda Export Promotion Board (UEPB): Advises government on export and products that can fetch good foreign exchange. UEPB also looks for markets for Ugandan products abroad.

Uganda Investment Authority: Advises investors on sectors/ areas for investment.

6. Lessons Learnt from Interventions in the Small-scale Dairy Sector

The dairy industry consists mainly of small-scale farmers who own 1-40 animals although there are a few large farms with over 200 heads of dairy cattle each. However, government efforts and all interventions concentrate on small-scale farmers. The lessons learnt from the interventions in the small-scale dairy sector include the following:

• The need to address marketing before production (link marketing to production).

Past intervention tented to concentrate on increasing milk production without addressing the marketing issues. As a result milk production was greatly increased and the farmers found that they had no market for the product. Prices for the product thus fell to levels that cannot sustain dairy farming especially in areas where exotic or grade dairy animals were reared. This led to frustration and some farmers contemplating abandoning dairy enterprises altogether.

• Prematurely introduced liberalized milk marketing.

There is need for a regulatory body to be put in place before liberalization of the industry so that the industry grows in an organized manner right from the farm level. In 1984, the World Food Programme provided assistance with Dry Skimmed Milk and Butter Oil. The intention was to make milk available to the urban populations; and at the same time raise money to rehabilitate the dairy industry. The milk was being reconstituted and sold by the Dairy Corporation. Unfortunately the reconstituted milk was not well accepted by most consumers, especially the infants. It had a certain smell that was unpleasant to some consumers. Infants preferred the milk that came directly from farms to customers and soon the same preference spread to adults. This marked the beginning of the trade in loose milk. Because there was no regulatory body in place to ensure that rules and regulations that included prohibiting sale of raw milk were adhered to, the practice spread all over the country.

The 1993 Dairy Master Plan Study recommended three major reforms in the Dairy Industry namely:

- Liberalization of the dairy industry.
- Creation of a Dairy Board
- Divestiture of Dairy Corporation.

Unfortunately the order of reform was not done in order of importance. The Dairy Board was not formed until 8 years later. In the meantime, milk traders took advantage of the liberalization and traded in raw milk, using plastic jerry-cans to carry the milk. There was no regulatory body in place to ensure order of procedure enforcement of the regulations.

In addition, the absence of a regulatory body led to unlevel trading ground in the dairy sector. Whereas most processors paid the farmers for their produce within 2 weeks after delivery of the milk often the processors defaulted, causing farmers to sell their milk to other buyers. The most available were usually the hawkers who often pay cash on delivery. Secondly because of the low costs of marketing and subsequent adulteration the hawkers paid a higher price to the farmer. This price "incentive" diverted farmers to the hawkers. On the marketing side, the hawkers sold milk at lower prices, distributed to clients at doorsteps, and provided credit facilities. These and many other practices have been difficult to reverse although DDA is currently addressing them with considerable success.

• Borrowing at the on-going commercial interest rate.

Borrowing at on-going commercial interest rate proved difficult for small-scale dairy farmers. Many borrowed money from commercial banks under several schemes that were put in place by government at the then current interest rates. They were however unable to pay back the loans because of the high interest rates and the prevailing economic conditions in the country. Many ended up losing their properties submitted as securities to the commercial banks. This rendered them jobless. Government put in place a Non Performing Asset Tribunal to collect the bad debts incurred and dispose of the properties on failure of collection.

• HPI projects have greatly benefited the poor.

Projects geared to the rural poor and operated at grassroots like the HPI, SAC and other related projects performed very well and have greatly benefited the rural poor especially women. They have achieved the objective of raising small-scale dairy farmers' incomes thus proving that livestock is very useful in addressing poverty. In addition, this has provided an entry point for addressing other issues like nutrition. Farmers have integrated livestock with vegetable gardens and utilized the manure for better management of their land resource and their cash crop fields.

• Too many activities took off at a go.

There have been many policy changes (liberalization, privatization, and decentralization) taking place at more or less the same time. This resulted in too many activities taking of at a go and created some confusion. An example is the decentralization of veterinary services and divesting of provision of animal health services to the private sector. This led to the current vacuum experienced in the dairy sector in extension services. The private sector was ill prepared for the divesture.

7. Production Systems and Estimated Quantity of Milk Produced.

The cattle production systems in Uganda depend upon the ecological and socio-economic setting in which they operate. The objectives of the farmers for dairy production can be divided into traditional and commercial sectors (Figure 1).

The traditional sector produces milk purposely for subsistence of the family. In this case milk is a major staple commodity and cattle are considered as live capital or valued for traction. Milk is sold if it exceeds what is required for home consumption. This production system is characterized by low external inputs and the farmers typically keep indigenous cattle.

The second major objective of dairy production is commercial. This is characterized by maximizing profit generated from dairy production. In this case emphasis is put on efficient use of production inputs, land, labour and capital. This system is characterized by high external inputs (ILRI /MAAIF, 1996).





UGANDA MILK PRODUCTION SYSTEMS

Some earlier studies categorized production systems as communal, semi-intensive (fenced) and zero grazing, the semi-intensive being further subdivided according to herd size (ILRI /MAAIF, 1996). These are as outlined in the following description.

Climate and altitude, soil types, disease and pest challenge, cropping systems, types of technology, socio-economic and demographic factors, infrastructure, and potential for intensive farming, differentiate the farming systems in Uganda. Cattle are raised under different production systems, namely: (i) pastoral (semi-nomadic) production, (ii) agro-pastoral (communal grazing) systems, (iii) beef ranching, (iv) intensive beef production (fattening), (v) dairy ranching, (vi) crop livestock mixed farming, (vii) semi-intensive dairying, and (viii) intensive dairying, with various specialized features. Despite the use of alternative terminologies to describe these production systems, it is possible to generalize features of each production system.

Dairy production systems fall within; the continuum ranging from semi-nomadic pastoralism to zero grazing (Fig. 1). This continuum encompasses indigenous zebu cattle kept on unfenced communal pastures, both indigenous and crossbred cattle on individual perimeter-fenced landholdings, crossbred or pure-bred dairy cattle (or both) on individual perimeter-fenced paddocks, and zero-grazing (usually exotic dairy cattle). Availability and access to communal pastures is diminishing. Perimeter fencing has resulted from increasing pressure on agricultural land due to population growth. This continuum of dairy production systems reflects a gradually increasing level of investment in both capital and dairy cattle management. Between the extensive and intensive management systems, there are a number of discrete systems that vary in objective, management strategies, attitude, feed and capital investment and level of productivity. Higher levels of investment in dairying are generally located near major urban or consumption centers that are associated with higher milk prices and stable demand for dairy products.

In intensive dairy production systems, the average farm size (about 1.5 ha) is significantly smaller than in all the other systems. It is generally a high altitude (mountain) zero-grazing dairying system, with bananas and coffee as the main food and cash crops, respectively. Other important crops include maize, beans, sweet potatoes, sorghum, and vegetable crops. Inter-cropping is commonly practiced. The dairy enterprises range from cut and carry systems (with 1-3 cows) to large farms (with about 70-100 cattle). Most dairy farms are fenced and some practice rotational grazing. Breeds of animals in these dairy production systems include purebred exotic animals (e.g., Friesian, Friesian-Holstein, Ayrshire, Guernsey, Black and White Dane), their grades and crosses. Intensive dairying is prevalent in Kigezi, Sebei, West Nile, Toro, Mbale, Kabarole, Bushenyi, Kabale, Kasese, Kampala, Jinja, Kapchorwa, Bundibugyo and parts of Rukungiri (MAAIF, 1993d; Atokple et al, 1995).

The dairy animals depend on local pastures, elephant grass (*Pennisetum purpureum*), crop by products such as sweet potato vines, banana peelings and stems, and spoiled or damaged crops. Manure from this system is usually applied on the banana plots. To a limited extent, farmers supplement their animals with purchased concentrate feeds, (usually 2-3 kg/cow/day at milking). Seasonal variation in quantity and quality of feed resources strongly influences milk production (Mbuza, et al 1996). Intensive dairying is practiced in the tsetse free areas that experience high rainfall (in excess of 1500 mm) and may be considered as demand driven (i.e. market-oriented). Some farmers grow high value fodder crops including elephant grass, Kikuyu grass (*Pennisetum clandestinum*), star grass (*Cynadon* spicies), and clovers (*Trifolium* spicies).

Semi-intensive dairying systems predominate in Mbarara, Mubende, Luwero, Mukono, Masaka, Iganga, Kampala, Jinja, Mpigi, Kalangala, Kabarole, Bushenyi, parts of Hoima and Bundibugyo districts. These medium altitude (1000-1500 masl) areas experience medium rainfall (between 1000-1500 mm). The main crops are Arabica coffee, maize, beans, cassava and vegetables.

Being also tsetse free, these areas are suited to exotic dairy animals (e.g. Friesian, Simmental), and their crosses with indigenous breeds. Farms are small, averaging about 1-2 ha in areas of high human population density and about 4-15 ha in relatively low-density locations. Large semi-intensive farms range from 20 ha to 40 ha. Herds on small farms have 5-30 animals; and on large farms range from 30 to 90 cattle. Some stall-feeding of dairy cattle is practiced using local pastures, elephant grass, crop by products such as sweet potato vines, banana peelings and stems, and damaged crops. It is common to find animals herded, tethered or grazed on hillsides, valley bottoms, and roadsides and on inter-seasonal fallows. The extent of communal grazing is very limited. Natural pastures constitute 80-88 percent of the land area. Planted pastures occupy the remainder.

In extensive dairy systems, farmers have access to considerable grazing land although the risks of tsetse challenge and cattle rustling impede investments in high yielding technologies. These systems are common in the lowland zones (750-1000 ml) that experience low and unreliable rainfall (less than 1000 mm). The major crops include bananas, cotton, finger millet, sorghum and tobacco. Average cropped area is about 2 ha and cultivation is mainly by hand. Generally, the cattle are indigenous breeds, their crosses with exotic dairy breeds and tropical breeds (e.g. Sahiwal, Red Sindhi). Little information is available on herd size. But herds are believed to be large and each with between 5 and 10 milking cows. These systems are prevalent in Kamuli, Mbarara, Pallisa, Tororo and in some parts of Luwero and Masindi districts.

Natural pastures, which vary with agro-ecology, are the major feed resources. In the Mbarara milk shed, pastures are dominated by *Themeda triandra* ecotypes, Acacia bushes and the dominant grasses include *Bracheria* spp, *Chloris gayana*, and *Hyparrhenia filipendula*. However, these rangelands have been extensively invaded by *Cymbopogon afronadus* and *Acacia hockii* and their carrying capacity levels have been seriously impaired. The Karamoja pastoralist systems depend on *Setaria-Chrysopogon* bushlands and thickets that are covered by *Setaria, Dichanthium, Erichloa*, and *Themeda* species of grasses. In drier areas (300-500 mm rainfall), *Chrysopogon* bushlands dominate the clay steppes.

Production parameters and management practices differ considerably between the three major production systems, especially in levels of capital investment and management practices. However, the differences are 'more of degree than of type'. Some of these differences relate to farm size, herd size and composition, degree of crop-livestock integration, herding and grazing practices, animal husbandry practices (e.g. breeding/mating management, calf rearing, etc.), forage species, level of capital investment, milk yields, and volume of marketed milk production (Table 2)

This study showed that:

- Semi-intensive large farms experienced the smallest cost followed by the semi-intensive medium and small farms.
- Zero-grazers experienced the largest cost of production per liter of milk because of their inability to benefit from the economies of scale.
- Communal grazers experienced high costs of production mainly because of inefficient management and low milk yield per cow.

Production Parameter		Dairy Production System	n
	Extensive	Semi-intensive	Intensive
Herd size	25	70 (30-90)	1 (+ followers)
Breeding cows and range (No)	11 (5-20)	28 (15-35)	1 (+ followers)
Lactating cows and range (No)	5 (2-10)	14 (4-18)	1 (1-3)
Predominant breed	Indigenous	Crossbreeds, Friesian	Pre-breds, Friesian
Level of Management	Average	Improved	Improved/High
Grazing management	Communal	Fenced grazing	Stall-feeding
Farm size (ha)	42	20	8
Cultivated land (ha)	5	2.0-2.5	3.5
Natural pasture (ha)	36	17	4
Planted pasture (ha)	0-1	0.5-1.5	1.5-2.0
Age at first calving (years)	3	2.5	2.5
Pre-weaning calf mortality (%)	30	20	15
Age at weaning (days)	200	180	180
Age & price of steers (years, U shs)	3 @ 200,000	2.5 @ 400,000	2 @ 1 million
Male progeny culling ratio	0.29	0.35	0.43
Female progeny culling ratio	0.29	0.34	0.42
Adult animal mortality (%)	10	5	5
Productive lifespan (years)	12	10	8
Value of culled cow (Ushs)	16,667	30,000	46,875
Lactation length (days)	200	270	305
Milk yield (litres/cow)	545	2,250	3,800
Milk for calf rearing (litres/cow)	127	266	420
On-farm consumption (litres/cow)	136	250	700
Marketed milk production (litres/cow)	282	1,734	2,680

 Table 2:
 Livestock Production Parameters Across Dairy Production Systems

Milk production has been reported to be restricted to the area commonly referred to as the milk shed area. This area extends from Mbale in the East to Kabarole in the West and Kabale in the Southwest (MAAIF, 1993). Total national milk production has grown from an estimated 365 million liters in 1991 to 900 million liters in 2001 (Table 3 and Figure 2). The estimates by district are as depicted in Table 4.

Source: Updated from UNDP/FAO (1993), Atokple et al, (1995), Survey Data (1996)

Table 3: Production Estimates 1991 – 2001

Year	Million litres
1991	365
1992	511
1993	548
1994	532
1995	551
1996	572
1997	593
1998	615
1999	638
2000	700
2001	900

Figure 2: Production Estimates 1991-2001



Table 4: Milk Production per District (2001 estimate)

District	'000 litres
Apac	5,562
Arua	17,900
Bundibugyo	8,603
Bushenyi	90,378
Gulu	1,682
Hoima	12,750
Iganga	17,042
Jinja	3,438
Kabale	14,537
Kabarole	35,124
Kalangala	2,164
Kampala	3,545
Kamuli	30,156
Kapchorwa	5,912
Kasese	6,458
Kibaale	6,014
Kiboga	4,070
Kisoro	1,291
Kitgum	1,688
Kotido	49,663
Kumi	1,718
Lira	3,919
Luwero	13,460
Masaka	45,694
Masindi	9,983
Mbale	42,406
Mbarara	144,085
Moroto	94,243
Моуо	3,558
Mpigi	30,462
Mubende	29,453
Mukono	34,563
Nebbi	16,400
Ntungamo	27,839
Pallisa	12,921
Rakai	34,191
Rukungiri	14,263
Soroti	2,380
Tororo	21,186
Total	900,703

8. Marketing Systems for Small-Scale Dairy Producers.

There are two main channels of marketing milk and milk products in Uganda, the formal and informal markets.

Informal Market

The informal market commands the largest share, nearly three quarters of the market. It is been the major avenue for marketing milk since the 1970s after the break down of the government owned Dairy Corporation. It has since become the source of income for more people and a threat to the formal market. Those in favour of the trade present the following claims:

- It creates income for many people.
- It provides an alternative outlet for milk that cannot enter the formal market.
- It brings milk is closer to the consumer.
- It provides consumers with affordable milk.

Those opposed to the informal market claim that it responsible for the constricted milk market due to the fact that a large proportion of the milk sold in the informal market is water, which has been added to increase profit margins. Moreover, most categories of vendors incur very little overheads as no value is added to the milk, and no taxes are paid. The worst and most serious scenario is that raw milk vendors interfere with the milk's compositional integrity, which could endanger the safety of the consumer.

There are three tiers in the informal sector; primary, secondary and tertiary vendors. The primary vendor buys milk from a framer and sells it directly to the consumer or to another vendor at roadside pooling centers or to a milk collection center. Primary vendors most commonly sell their milk at privately owned MCCs or MCCs which serve processors whose quality requirements are less stringent than those of Dairy Corporation Limited (DCL), a government owned company soon to be privatized. DCL is generally not an attractive client for primary vendors because of its low buying price, mode of payment as well as stringent quality requirement. However, a few primary vendors supply some DCL-MCCs especially where private vendors are not active.

Secondary vendors buy milk from roadside milk pooling centers. The pooling centers are quite often under a tree, which provides shade for the vendors and their milk while waiting for secondary vendors from urban areas, mainly Kampala. Using open vans and pick-ups, milk is collected in 20-liter plastic jerry cans from various centers until the van is full. The most commonly used vans have varying capacity of 80-120 twenty-liter jerry cans each. Plastic jerry cans are preferred over aluminum churns because they are cheap and are easily packed on the vans to maximize the carrying capacity.

Tertiary vendors on the other hand are in urban areas; they buy milk from secondary vendors, boil it and sell it at various "candlelit" nightspots after boiling and chilling or while still warm. Some secondary vendors also boil and /or cool milk and operate retail outlets.

It is difficult to estimate with certainty the amount of milk that is traded through the informal market sector nationally. However, a very conservative estimate based on the rapid appraisal on the informal milk trade in the central rural region showed that over 8.9 million liters of milk were traded in this form in 1996. It is reasonable to assume that about the same amount originates from the central urban and about half that much from the western region. At that time, less than 10% of the milk produced from the western region was traded on the formal

sector. Although one could not extrapolate this situation to apply to the whole country, it illustrated the dominance of the informal market sector in the Ugandan dairy sector.

The Formal Market

This mainly consists of large-scale processors with the majority having milk collection centers situated in the highly producing areas and purchase raw milk at varying prices (Table 5). The processors mainly pasteurize and pack liquid milk under strict quality control, though other dairy products may be produced on a small scale. After processing, the products are distributed to their retail outlets using their delivery vans.

Table 5:Average Buying Price per Liter (U Shs.)

	Northern	Western	Eastern	Central- Urban	Central - Rural
Average price in wet season	-	150	242	367	312
Average price in dry season	-	346	338	433	400

Note: This is the price at which processors buy raw milk. Source: Field interviews

Currently, there are nine dairy processing companies (Text box 2). A big percentage of products from these processing companies are sold in urban areas, with very little going back to the rural areas.

Company	Location
Alpha Dairies	Mbarara – Western region
Country Taste	Mbarara – Western region
Dairy Corporation	Kampala – Central region
GBK	Mbarara – Western region
Jesa Farm Dairy	Busunju – Central region
Kaisa Dairy	Kamuli – Eastern region
Sunshine Dairies	Kampala – Central region
Teso Dairies	Soroti – Eastern region
White Nile Dairies	Jinja – Eastern region

Products produced at these companies include UHT-milk, pasteurized milk, ghee, Yogurt, milk cream, flavoured milk, butter and cheese (Table 6).

Table 6:	Dairy	Products	Produced	Per Region
	•			0

	Northern	Western	Eastern	Central-	Central -
	Region	Region	Region	Urban	Rural
UHT-milk (liters)	-	20,000	12,000	46,000	-
Pasteurized milk	-	105,000	55,000	85,000	95,000
(liters)					
Ghee (Kg)	-	650	10	350	750
Yogurt (liters)	-	1,500	625	9,351	1,022
Milk cream (kg)	-	20	-	150	-
Flavoured milk	-	-	-	250	-
(liters)					
Butter (kg)	-	25	-	360	-
Cheese (kg)	-	25	-	223	-

Source: Land O' Lakes – Dairy Sector Study 2000

9. Types and Level of Post-Harvest Losses in the Small-scale Dairy Sector Across the Different Marketing Systems.

Overall the major causes of milk losses are; limited demand for milk mainly attributed to the low purchasing power, poor distribution network, unregulated marketing channels and lack of access to export markets. Losses are highest during the flush season.

Post Harvest Losses at the Farm

Post harvest milk loss is a major constraint affecting the efficiency of production in Uganda. Milk losses under all production systems are significantly higher in the western region than other regions. This may be attributed to high milk production resulting in large proportions of milk which could not be marketed. It is estimated that during the rainy season, up to 50% of the milk in the southwestern milk shed remains at farms unsold and the prices paid to farmers can be as low as US \$0.05. This creates an "artificial surplus" of milk.

In the eastern and northern parts of the country, milk losses are higher at the small and medium size farms than the large farms which could be suggestive of better management practices at the more commercially oriented large size farms. In the central-urban region, the reverse is true, that is, the large-scale zero-grazing and the free-range grazing farmer loses more milk on the farm than the small-scale counterpart. This is probably attributed to marketing constraints. In the central-rural region, the largest proportions of milk loss on the farm that occur are attributed to lack of easy access to the market. The losses are highest for the small-size farmers compared to the large-size farmers.

Post Harvest Losses at the Processing Plants

In the formal milk market less milk is lost. This is mainly due to the fact that such milk is produced in areas with better-developed collecting/marketing infrastructures and better handling practices are used. However, this difference may be masked by the big quantities of milk, which may not be collected from the farms or rejected at the MCCs during the wet season.

Milk losses that occur at processing plants are generally lower than those occurring at other points of the milk production chain because of the application of stricter quality control measures. Strict quality control measures are enforced at the plants to safeguard against such obvious losses due to poor sanitary conditions commonly associated with farmers and vendors. Milk brought for sale is subjected to tests to ensure that only a good quality product is paid for. Poor milk is rejected and the owners (sellers) are advised to take it back at their own cost.

However, most of the losses (68%) are mechanical (spillage/improper sealing of cans and accidents-cans falling off), 32% are due to power cut and improper handling by the workforce within the plants.¹ Table 7 presents the quantities of milk handled and losses incurred at different processing plants.

Although a number of microprocessors have come on the market, those who handle substantial quantities of milk are located in Kampala. The Kampala market is increasing because of the higher purchasing power among the residents. These processors buy raw milk from Luwero, Nakasongola and Mbarara. Although post harvest losses at the

¹ Land O' Lakes – *Dairy Sector Study 2000*

microprocessors level are known to occur at an appreciable level, they have not been quantified.

The large-scale processors experience fewer losses than the small scale/ microprocessors mainly due to enforcement of good handling practices and good manufacturing practices by the former. It is known that consumers at times return milk that is improperly packaged for replacement at the processors' appointed agents or retail outlets from where they bought it.

Processor	Location	Daily	Est. Daily	% Daily Loss
		Purchase	Loss	·
Large-scale				
Country Taste	Mbarara	10,000	60	0.60
Dairy Corporation	Kampala	80,000	150	0.19
GBK Dairies	Mbarara	30,000	30	0.10
Jesa Dairy Farm	Mpigi	3,500	15	0.43
Kaisa & Sons	Kamuli	2,000	25	1.25
Paramount Dairies	Mbarara	700	8	1.14
White Nile Dairies	Jinja	2,500	25	1.00
Small-scale				
Agaliawamu	Kampala	2,800	45	1.61
Annegico	Mbarara	450	5	1.11
Balidawa Simon	Jinja	2,500	25	1.00
Boona Emma	Mbarara	500	5	1.00
Galuwero	Kampala	40,000	240	0.60
Mukono Dairies	Mukono	200	3	1.50
Nabuka Dairies	Mukono	2,500	20	0.80
Solomon Market	Kampala	50,000	300	0.60
Tom Mubisi	Mbale	400	5	1.25

 Table 7:
 Quantities of Milk Purchased and Lost (litres) at the Milk Processing Plants

Source: Field Interviews

Post Harvest Losses at Milk Collection Centers

In the Western region² (Mbarara, Kabarole and Kabale), milk losses at the MCCs are lower than the losses found in the Luwero, Nakasongola and Sembabule districts. This difference can be explained by the relatively controlled raw milk quality destined for the formal market in the Western region as opposed to the lack of control and poor quality of the milk predominantly sold in the informal market from the rural-central regions.

The highest source of milk loss in the western milk shed is due to lack of market particularly in the wet season. These losses mainly occur at farm level and during handling before reception at the MCC. On the other hand, the major causes of milk losses in the Luwero, Nakasongola and Sembabule districts are mainly attributed to lack of marketing infrastructures and poor quality. The largest proportion of milk in these areas is marketed through roadside pooling centers. These centers have no cooling facilities and the milk is handled using plastic jerry cans, which are difficult to clean, and they are often closed using highly contaminated materials such as bananas and plant leaves. In the western region, usage of plastic jerry cans is minimal; aluminum churns are commonly used and are easy to clean.

² The western region in this description represents a fairly developed commercial dairy system while the Sembabule and Luwero/Nakasongola areas represent the traditional predominantly subsistence animal husbandry systems.

In Nakasongola alone there are over 120 pooling centers that collectively supply about 16,000 liters of milk per day in the wet season and about 5,400 liters of milk per day in the dry season. Over one third (37%) of the milk supplied during the wet season sours and is returned to the primary vendor at the pooling center. The loss during the dry season due to souring and returned to the vendor at the pooling center is much less (11%).

In Luwero/Ngoma area, there are 5 pooling centers, which collectively supply about 9,600 litres of milk per day. Because of the similarity in general conditions, the post harvest milk losses from these districts can be assumed to be similar to those in Nakasongola. Table 8 below presents estimated percentage post harvest losses at the farm and MMCs in the different regions of the country.

Region	Post Harvest Milk Losses		
	On-Farm Losses	MCC Milk Losses	
Northern	12.3	-	
Eastern	9.8	-	
Central Urban	15.4	-	
Central Rural	52.0	29.0	
Western	23.6	3.0	

 Table 8:
 Post Harvest Milk Losses (%) at the Farm and MCC

Source: Land O'Lakes – Dairy Sector Study 2000

Both on-farm and MCC milk losses are highest in central-rural and lowest in the eastern and northern regions. The significantly observed losses in central-rural region can be mainly attributed to the poorly developed milk collection and marketing infrastructure. This region predominantly serves the informal sector, which does not put major emphasis on quality. Therefore, the lack of quality consciousness also contributes to these high losses.

Post harvest losses of milk vary with season and with degree of infrastructure development. Losses are higher in the wet season than the dry season. Earlier studies attributed this situation to the poorer sanitary conditions that prevail during the wet season.

10. Consumption Patterns and Consumer Preferences

In Uganda, the most commonly consumed types of milk are:

- Unprocessed raw milk,
- Domestically processed packaged milk (pasteurized and UHT),
- Boiled unpackaged milk.

The most commonly consumed dairy products as seen in Figure 3 include:

- Yoghurt and indigenous fermented milks
- Ghee
- Butter
- Cheese
- Ice cream
- Sweet and sour cream

Figure 3: Most Frequently Consumed Milk Product



Unprocessed milk marketed through the informal channels has the highest demand followed by processed packaged milk. Different types of imported milk including milk powder, UHT and condensed milk are available in many supermarket outlets. Such products are, however, consumed by a small segment of the population comprising mainly the high-income class and expatriates. As indicated above milk is also consumed in different processed forms. The level of consumption of dairy products for most Ugandans is still very low, though increasing.

Factors Affecting Milk Consumption

Household consumers attribute their milk consumption pattern and habits to various reasons, which can broadly be categorized as follows:

- Nutritive value of milk: Knowledge of the nutritive value of milk positively influences milk consumption patterns. Parents especially value milk as food for their growing children.
- Income levels: It is an important determinant of milk consumption; higher per capita milk consumption is observed in well-to-do households and the reverse for poorer households. It has been noted that household propensity to take milk relates directly to their income. Expenditure like school fees, lighting, clothing, salt etc come in priority to milk to most low-income households.
- Cultural factors: The pastoral communities of western, central and mid-north regions regard milk as the staple diet. The use of milk as a form of payment in-kind for farm labour and its use to support poor households all combine to increase consumption of milk in rural producing areas. Thus even the very poor in most of the western region take some considerable amount of milk as part of their diet.
- Proximity to milk distribution outlets: This favourably influences the consumption of milk. It could be explained by the increased number of milk shops fitted with coolers in urban centers. The extensive development of door-to-door delivery of milk in urban areas by informal vendors also contributes to the level of milk consumption.
- Taste and preference: Some consumers like the taste and satisfaction from milk, independently of all the above factors.

Consumer Behaviour

Milk ranks fifth amongst beverages consumed regularly (Fig. 4) with an annual average consumption per capita of 46 liters per annum (Table 9). The figures in table 9 are based on the assumption that other factors that affect milk consumption (consumption per household, household size, income, and other consumer behaviour, price of milk and milk substitutes, etc) remain constant.

Apart from availability and cost, consumer behaviour influences the level of milk consumption. Milk in Uganda is consumed in five main forms:

- 1. Warm after boiling.
- 2. Cold after boiling.
- 3. In beverages, mainly tea, coffee and cocoa.
- 4. In raw form (un boiled).
- 5. As fermented milk.

High-income groups and people with a traditional cattle-keeping origin consume milk in forms of 1 and 2. Consumption of milk in these two forms leads to high consumption levels. Consuming milk in form 3 is perhaps the most common practice among most Ugandans. This is characteristic of low-income groups and people suffering from mild forms of lactose intolerance and people without a milk drinking culture. However, it is also a common social practice among affluent groups. Drinking raw milk (un boiled form 4) is common among traditional cattle-keeping groups. This is however a dangerous mode of consumption that DDA and the Ministry of Health are discouraging this practice to guard against disease transmission to man from milk.

Milk is also consumed in fermented form (form 5). The fermented milks consumed in Uganda are mainly those made through traditional fermentation of raw milk by back slopping or culture enrichment from a previous batch. The inoculums used predominantly consist of lactic acid bacteria obtained through natural selection. Commercially fermented milk includes yoghurt.



Figure 4: Beverages Taken Regularly

Preference for raw (unprocessed milk) is an important factor in understanding market vent limitations of the whole sector. This is because the informal vendors add water to artificially increase volumes, and also because it checks the market for milk factories, which could potentially, buy all the milk produced in the country. The reasons why some people prefer raw milk include:

- 1. Better taste because it is whole milk with cream and fat, as well as having the characteristic farmyard odour from raw milk.
- 2. Lower prices compared to processed milk
- **3**. Ready availability; distributed by vendors in jerrycans and milk cans on bicycles, thus accessing even remote areas, in several cases door-to-door.
- 4. Income of the household

Region	Year			
	1999	2000	2005	2010
Northern		66.00	75.51	84.78
Eastern		154.17	175.93	201.71
Central		564.42	621.91	688.12
Western		319.18	363.23	415.55
Total (National)	1,012	1,103.77	1,236.58	1,390.16

Table 9:National Consumption Estimates:

Source: Land O'Lakes – Dairy Sector Study 2000

Data reliability: Figures calculated based on data from previous table and Uganda Bureau of Statistics (national population estimated at 22 million). 1999 figure calculated as follows: Population $22m \times 46 l/year = 1,012 l/year$

A 2000 household survey indicated that consumption levels of milk during the 1998 – 2000 period had decreased slightly and the primary place of consumption was the home for both milk and dairy products (Fig. 5). The major reasons attributed to declines in milk consumption included:

- Reduced household income, hence a decrease in purchasing power. When income falls milk tends to be categorized as a luxury good rather than a necessity.
- Increased household size which constraints the budget of the household.
- Increase in milk price, although this has been very small in the last two years and too gradual to cause a significant decline in quantity of milk demanded.

Households whose milk consumptions had increased gave the following as reasons for increase:

- Increase in household size. With the increase in the number of family members, households increase the amount of milk bought in order to satisfy every member.
- Increase in income in the household.
- Decrease in milk price. With a fall in milk prices, milk demand and consumption increases. This usually occurs in the wet season. However, milk prices in Uganda have been generally stable over the past years.





Consumption and Demand for other Dairy Products

The consumption of other dairy products (ghee, yoghurt, butter, cheese, ice cream) is much lower compared to the consumption of milk. Table 10 presents the estimates/projections for 2000 through to 2010.

Table 10: National Estimates and Projections of Dairy Products Consumption, 2000
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Product	2000	2005	2010		
Ghee (tonnes)	13,265	14,930	16,883		
Yoghurt (tonnes)	37,268	41,932	47,232		
Butter (tonnes)	31,822	35,376	39,506		
October 1 and Oll alian Dates October 0000					

Source: Land O'Lakes – Dairy Sector Study 2000

11. Levels and Extent of Public Health Risks Posed by Milk and Dairy Products.

At the farm sources of contamination are mainly from the shed, the milker, feed trough, water, milking utensils, soil dust, feed and the cow. Ugandan dairy farmers have not reached a level where they can keep the initial bacterial load in milk from a healthy cow to a minimum. During milking and milk handling therefore, there is a high risk of contamination from the sources mentioned above. It has been established that the bacterial load in milk produced in Uganda is normally higher than 300,000cfu per ml. The majority of farms do not have cooling facilities and are located long distances from the collection centers, which are the first points of cooling milk after harvest. Temperature of the milk from the udder is at 37° C, which is an optimal temperature for growth of mesophilic bacteria. By the time the milk reaches the first cooling center, the quality will therefore have deteriorated. From the above initial bacterial load, the time taken between milking and the first cooling at the collection center is considerably long. This has a significant detrimental effect on the bacteriological quality of the milk and poses a public health risk as some traditional dairy products like butter; cultured milk and *ishabwe* are prepared using raw milk. This is a common practice in the southwestern parts of the central and eastern regions.

The mode of transport is dominated by open pick- ups operated by private transporters (middlemen). Milk is transported in plastic containers as well as aluminum cans. The issues of time delays, temperature rises and initial bacterial load remain. Both bacteriological and chemical quality of the milk cannot be guaranteed. There is rampant adulteration of the milk during transportation especially in the informal sector. Various chemicals are used to prolong the life of the milk in the absence of cooler tanks. Dirty water is used to increase volumes in order to earn more profit. All these pose health risks to the consumers.

Dairy products produced by microprocessors include pasteurized milk, fermented milk, ice cream, cheese and cream. In Uganda these products are manufactured at the farm or in hired premises in urban areas. There is a general deficiency of good manufacturing practices at this level. The personnel are not properly trained, the buildings and surroundings they operate from are sometimes not hygienic, sanitary facilities are lacking, equipment used does not meet the required heath standards and the mode of storage and distribution leaves a lot to be desired.

Other areas that pose health risk at this level include lack of clean water supply, quality and availability of a starter culture, mode of products delivery and cooling chain maintenance. In most cases, products especially pasteurized milk and fermented milk have been found recontaminated after processing because of poor handling, lack of cold chain, and use of plastic containers (Jerry cans and buckets) during distribution. The most important ingredient to combat all these limitations is training and equipping personnel at every level.

At the Large-scale processing level products at this level include pasteurized milk, long life milk (UHT), yoghurt, ice cream, butter, cheese among others. Level of contamination also originates from various operations in the industry that have not been managed well. These include but are not limited to:

- Personnel
- Dairy buildings and surroundings
- Sanitary procedures, personal hygiene
- Equipment and utensils
- Processes and control
- Storage and distribution

It should however be noted that the post contamination levels have been recorded. The above critical points have been pointed out as source of contamination. They can be minimized by training of personnel at various levels in GMP, HACCP and processing technique, good laboratory practices. At both micro and larger scale milk processing enterprises, coordination and enforcement of standards should be strengthened.

Milk and dairy products from both micro and large-scale processors pass through the same distribution channels, some of the large-scale processors have distribution trucks (though not adequate). The small-scale processors do not have proper distribution trucks; they use crude means at uncontrolled temperature. However, at the retail level the two use the same outlets in many cases.

At most of the retail outlets, unskilled personnel employed do not appreciate the perishable nature of milk and dairy products. Many shops and other premises are not designed to handle dairy products. They have insufficient area that compromises hygiene and are not vermin and dust proof. The freezers and fridges in these shops are not restricted to milk and dairy products storage. This raises milk and dairy products contamination, mechanical damage and adulteration. Temperature management in freezers and fridges is difficult to control because of the prevailing erratic power supply, lack of a standby power source and uncontrolled opening and closing.

12. Existing and Planned Dairy Information Systems in Relation to Key Smallholder Dairy Sector Stakeholders.

Data and Information Gathering.

The Dairy Development Authority is mandated by an Act of Parliament to pool dairy processing and marketing data. However, it is taking the initiative to establish a comprehensive database for the entire dairy industry. This is expected to serve as an all round source of data and information for all stakeholders in the dairy sector. The DDA is also establishing a library of information for the dairy sector.

The Authority collects data related to milk bulking, transportation and processing and most of it is attributed to the smallholder dairy industry stakeholders because they are the dominant players in the dairy sector. There are a few large operators in the country who are mainly involved in processing and marketing of about 20% of the marketable milk.

The collection of dairy production data at farm level is currently hindered by lack of operational resources. Other means of collection of data/information in the dairy sector is through meetings with stakeholders as well as reports produced by other organizations/institutions involved in dairy related activities e.g. the National Agricultural Research Organization, Universities, and Non-Governmental Organizations (NGO) among others. One NGO called Food Net has been instrumental in collection of price information from various parts of the country using mobile telephones and passing it over to the community-based radio stations for broadcasting. The information collected also includes milk prices.

Information Dissemination.

Currently there is no established system for disseminating information to stakeholders. The latter often get information when they visit the DDA secretariat. Occasionally DDA publishes dairy industry information in the print and electronic media. Workshops, seminars, and meetings of stakeholders have also been major avenues for disseminating information to stakeholders.

The DDA publishes an annual report about its activities and the entire dairy industry. It is planned to start publishing a biannual bulletin about the dairy industry and to establish a computerized database system, which will automatically generate reports on the dairy industry. Information will be disseminated to stakeholders through their organizations, local government offices and the extension-advisory service providers. Establishment of the computerized database system is being delayed by lack of funds.

DDA is expecting to begin sharing information with stakeholders on the worldwide web. There is a plan to set up a website although this will have very limited use as an avenue for disseminating information to the smallholder dairy industry stakeholders many of who can not read and write, operate mainly in rural areas, and have very limited access to modern information and communication technologies.

Information Requirements of the Dairy Industry

The Dairy Development Authority recognizes the need to establish an effective system for collecting, processing and disseminating accurate, timely and demand driven information to the various stakeholders in the dairy chain. A reliable and effective system for disseminating information regarding quality requirements, standards, Hazard Analysis and Critical Control Points (HACCP) as well as Good Manufacturing Practices is necessary for establishing an

integrated and credible quality assurance system along the entire chain, and for strengthening the regulatory services of the Authority.

There is a need to establish a market information service to support the activities of dairy traders and farmers' marketing organizations. There is also a need for a producer information service to address the information requirements of farmers for example regarding sources and prices of inputs and breeding stock, opportunities for training/skills enhancement, production methods, and the availability of technologies and services. The Authority urgently needs to build capacity and develop effective strategies for collection and processing of data as well as dissemination of information to the various stakeholders.

13. Strengths, Weakness, Opportunities and Threats (SWOT) Analysis of the Current Situation in the Dairy Industry

An analysis of and the Dairy Industry's situation, and the environment in which it is operating reveals the following strengths, weaknesses, opportunities and threats.

Strengths

- **Government support:** There is good commitment from the government to ensure orderly growth of the DI. Policy reforms of privatization, liberalization, decentralization and democratization have had a positive impact on the industry. Production of milk has more that doubled in the last ten years and there are nine private processing companies where there was only one.
- **Creation of the regulatory Body:** This allowed for the separation of development and regulatory function from commercial functions. This body is independent and can therefore spearhead regulation without fear or favour.
- Availability of dairy farming land. Uganda is endowed with enough dairy farming land and pasture. The weather with two rainy seasons a year is favourable to dairying. This gives Uganda the competitive advantage over its neighbours who frequently experience prolonged dry seasons.
- Large stocks of indigenous dual-purpose animals. The indigenous animals in Uganda are tolerant to most diseases and tropical climate.
- Women participation. Women have been very active participants in the DI since the introduction of heifer projects and the zero-grazing philosophy. Their participation has greatly contributed to increased household income, food security and nutrition.
- **Increasing levels of milk production.** The increasing levels of milk production that have doubled in the last 10 years will contribute to the goal of self sufficiency in milk and dairy products. Uganda is targeting annual production of 1.4 billion liters by the year 2006.
- Willingness of stakeholders to change. Willingness of dairy industry stakeholders to form large groups that can address their needs is a great advantage to the industry. In 1999, almost all operators engaged in the informal milk trade were organized into an Association the Uganda National Dairy Traders Association (UNDATA). Membership included those involved in transportation, milk boiling and cooler operators. The operators agreed to convert from boiling milk to use of appropriate technology bulk pasteurization. The Association elected a representative to the dairy Board. Recently, in 2002 dairy farmers also formed their own association, the Uganda Dairy Farmers' Association (UDFA).

Weaknesses

• **Small markets.** Markets for products are mainly in urban areas where 15% of the Ugandan population leaves. This is too small a number to purchase produce from 85% of the population.

- Low purchasing power. Most consumers complain of lack of money to purchase milk. Consumers attribute this to low disposable incomes as well as ignorance of the value of milk and dairy products. Poverty prevails in all rural areas with 48% of the population living in absolute poverty.
- **Poor and inadequate infrastructure.** Infrastructure for transporting, cooling, and distributing produced milk from rural to major consumer centers in urban areas is greatly lacking. In some areas the cold chain is non-existent along the dairy collection and distribution chain.
- Low levels of training, extension and credit services. Most farmers especially in rural areas do not have access to extension/advisory services and therefore are not given adequate skills and knowledge in key production subjects. Similarly, most farmers do not have access to credit because they lack collateral and credit institutions regard agriculture as a risky business.
- **High transport and marketing costs.** Ugandan transport is primarily by road. This is often means covering long distance on bad roads in the countryside. With the high cost of fuel, this makes transport and hence marketing and distribution expensive.
- **Belated regulatory framework.** DDA as a regulatory body was operationalized eight years after the industry had been liberalized. This meant the various operators had developed their trade procedures, which were largely incorrect. Changing them to correct procedures meets resistance, and costs more time and money.
- **Inadequate market information.** There is inadequate knowledge and information about both the local and distant markets. In addition the stringent quality and sanitary conditions imposed by European and American countries do not allow Uganda to participate in global trade.
- Lack of strong farmers' organizations. This makes it difficult for the dairy farmers to make unified strategies for the DI and to receive certain services.

Opportunities

- **Growing economy.** The growth of Uganda's economy offers expanded or new markets for dairy products. There is a liberal exchange control system attractive to investors.
- **Conducive climate.** The climate is conducive for dairy farming. However, the seasonal variation in the quantity and quality of forage affects production. Promotion of utilization of conserved excess forage and use of abundant crop residues during the dry season would alleviate the problem.
- Low milk production costs. Uganda enjoys the lowest milk production costs in the East African region. The systems utilizes minimum inputs and therefore farmers are able to withstand fluctuations in the farm revenue during dry seasons; when the price falls in the flush season, or when milk is not collected due to inaccessibility. This method of production has enabled the national herd to survive so many challenges in this country including shortage of drugs during the difficult years of economic collapse.

- **Increasing population (urban and rural).** Uganda has one of the fastest growing populations in Africa. This will lead to increased milk consumption, internal milk marketing and hence stimulate more production.
- The cattle breeding plan to increase the productivity per animal. A national cattle breeding plan has been put in place and the organization to spearhead this is currently being strengthened. This will contribute to the development of the dairy industry in terms of availing high producing dairy animals to farmers.
- Feed resources still available. There is a potential for higher milk yield through better use of crop residues and by-products by up-grading them. Emphasis must be on technologies that are simple, low-cost and easily adoptable to increase nutritive value.
- **Unexploited export markets.** Uganda is very keen on regional cooperation and is an active member of both the EAC and COMESA. Creation of regional trade units will broaden the market for milk and dairy products.
- **Goodwill from the public.** There is good will from the general public and development partners towards the DI and DDA.

Threats

- Unregulated markets. The formal market collects and processes milk before marketing thus adding value and rendering the products safe for human consumption. This unfortunately raises the consumer price for the products thus making them less attractive. The informal market on the other hand sells raw milk and because there is no value addition, they sell at low prices thus undercutting the formal sector. Losses are experienced in this sector due to inadequate quality control, leading to low returns from retailers.
- **Milk imports.** Although the World Trade organization has advocated the removal of subsidies on farm inputs the world over, still some countries offer both direct and indirect subsidies to their farmers to produce for export. These subsidies make the imported dairy products cheaper that the locally produced ones and pose a threat to the industry.
- Lack of subsidies. The technology used in processing is capital-intensive. Uganda does not offer subsidy to the dairy producers or processors who find the technology too expensive. The high cost of stock feeds and veterinary services further reduce the viability of dairy enterprises.
- **High cost of borrowing.** The high cost of credit and the lack of it reduces the viability of dairy projects.
- **Pollution from urban farming.** Intensive farming is carried out in the urban and periurban areas on very small plots, where there are limited facilities for manure disposal. This needs to be planned for; otherwise it can cause an environmental problem in the future.

14. The Potential Role of Small-scale Dairy Farmers and Organizations for a Sustainable Dairy Sector Designed to Meet Current and Future Consumer Needs.

Small-scale dairy farmers should form strong producer groups/associations/ cooperatives that will spearhead their cause. There is great potential for small-scale dairy farmers and organizations increased participation in bulk milk collection and transportation and marketing. This they can do by establishing private collection infrastructure and acquiring private transport facilities. Dairy farmers' groups have entered into agreements with the largest dairy processing company to man the milk collection centres. This will empower them and enable them bargain for better prices amongst the available processors. Furthermore, Ugandan dairy farmers through their national body, the Uganda National Dairy Farmers' Association are considering purchase of the largest milk factory in the country, Dairy Corporation Ltd. If achieved, they will be assured of a market and producers and consumers should get a better deal.

Small-scale farmers can also participate in value addition either by undertaking small scale processing or by establishing cooperative owned processing facilities. A good number of farmers are already practicing this in either their individual capacities or as groups. The DDA has greatly encouraged this through awareness meetings and workshops.

Farmers should be encouraged to upgrade their enterprises from the current subsistence level to commercial production of high quality milk through use of improved dairy technologies. This may be achieved through procurement of extension services as groups as it is likely to be cheaper and therefore affordable to many. Farmer-owned extension/advisory services should be supported. This way, farmers will participate in procurement, financing and management of service delivery systems that complement their work including veterinary, breeding/artificial insemination, and input supply system. Furthermore, they should undertake market studies in order for them to clearly understand the current and potential market and therefore produce for the market.

Farmers should participate in mobilization of credit and development resources through their groups and cooperatives. They should identifying credit facility intermediaries other than commercial banks that can advance credit on favourable terms. They also have potential to participate in research and development activities such as:

- Identification of training needs.
- Contribute to training costs.
- Identification of research needs and setting priorities.
- Support and take part in research programs.
- Participating in development and enforcement of standards and regulations in the sector.

This will empower them to own their destiny.

15. A Strategy for the Sub-sector Improvement Program – the Case for the Informal Sector.

The informal sector is an aggressive segment of the dairy industry commanding about three quarters of the market share. It has been used as a major channel for marketing milk in Uganda for a very long time and its milk is low priced, thus difficult to change.

The milk in the informal sector is low priced because:

- The traders do not care for quality they tend to add water (usually dirty water) to their milk to increase volumes, thus more profits. For the urban poor, this is the type of milk that they can afford to buy for their families.
- Very little costs are incurred since they add no value to the milk (some boil), pay no taxes and transport their milk under un-refrigerated conditions normally nearer to the consumer in cheap, plastic unhygienic jerry cans.

Since the Dairy Industry Act 1998 was enacted and DDA became operational, issues in the informal sector began being addressed. As a first step, there was a registration exercise of all milk traders. This included processors, bulk agents and transporters. This was carried out to identify those engaged in the dairy trade and their addresses/location. Knowing their location is very important especially when there is need to make a follow- up. Some traders in the informal sector had to get premises. However, some are still transporting milk on bicycles and selling milk on tables near roads but will soon be stopped.

After the registration exercise, inspection of all registered premises was done to monitor the sector for level of compliance with the Code of Hygienic Practice for Milk and Milk Products (Uganda Standard 163:2000) developed by UNBS based on the Codex Alimentarius. Good Manufacturing Practice (GMP) and Non-complying traders are advised on areas for improvement. A certificate to trade was given to those adhering to GMP. This is an on-going process.

DDA has also engaged in a move to completely phase out the use of unsuitable containers plastic jerry cans, a vessel normally used by the informal traders to transport milk to the consumers. DDA is phasing out the use of jerry cans because of the following reasons:

- They are hard to clean because of their shape and their surfaces easily develop scratches with time.
- Jerry cans impart a bad odor to milk as a result of chemicals leaching to milk and possibly due to the fact that jerry cans are multi use containers. They may have previously contained pesticide, paint, fuel, drugs etc.
- Jerry cans accumulate heat and in addition to time involved in un-refrigerated transport, milk can easily get spoilt.

DDA is thus is promoting phasing out use of jerry cans to protect consumers and help farmers and traders to reduce post harvest losses. Steps taken so far are sensitization of stakeholders and actual apprehending of the culprits with the assistance of the police force. Some of the vendors have already bought the stainless steel or aluminum cans and are using them for milk transportation.

Another bad practice of the informal sector was the repeated boiling of milk. When DDA carried out tests of the nutritive quality of milk, the protein quality was alarmingly low. DDA thus identified and located all the major boiling centers in and around Kampala city. The traders engaged in the practice were advised to change to pasteurizing milk. At the moment

some centers have started pasteurizing milk using appropriate technology batch pasteurizers. These pasteurizers use firewood instead of electricity because it is a cheaper source of fuel. They are also affordable for the category of traders.

In addition to the above measures, DDA has set up a laboratory to continuously monitor the quality of milk on the market. Samples are randomly picked and taken for analysis. If an offender is found, DDA advises them accordingly.

Training is another strategy being used by DDA to educate the informal sector in handling of milk. The traders have been taught how to test for good quality milk and why they should not adulterate milk. Analysis results of samples collected from the various traders are discussed and explanation of the health hazards articulated. Most of the traders never knew the damage the health risks their clients faced, including their own households, since they also consumed the same milk. The training center in Entebbe will further enhance this training. A code of hygienic practice has also been developed to assist in training processors, traders, farmers and transporters of milk and other dairy products.

Awareness meetings with farmers, processors and traders are being held to bring about partnership that can improve on the quality of milk sold, realistically pay the farmers and to remove the stigma that polarizes the two groups (formal processors and informal traders) who are competitors. The meetings will also bring about positive cooperation and harmony. Traders and processors have also been urged to form groups and associations in order to have collective effort in addressing their problems. In 1999 all the traders engaged in informal milk trade were organized into an Association. The membership included those engaged in milk transportation, milk boiling and cooler operators. This association elected one member to represent this interest group on the Board of Directors of the Dairy Development Authority.

There is a pending plan for cooler operators who supply milk in urban areas to revert to supplying pasteurized milk. They will only be licensed if they deal in pasteurized milk. The milk traders will enter an arrangement with dairy factory owners. The trader will deliver milk to the factory; the milk will be pasteurized and delivered to the traders' outlets. Such traders will deal in loose pasteurized milk, but will also sell in the same outlet processed and packaged milk from the processors. This will have the following advantages:

- Clear and wholesome milk to consumers
- Consumers will buy loose milk out of choice, instead of being produced of last choice
- This relationship between processors and milk traders will produce/eliminate the hostility between the two parties (formal and informal)
- The factories will improve their capacity utilization. This will improve the profitability of their factories.

The strategy of vertically integrating producers (farmers) into processing and marketing aims at eliminating middlemen and increasing the profitability of small-scale dairy enterprises. Arrangements are at advanced stage. Dairy farmers' groups have entered into agreements with the largest dairy processing company to man the milk collection centers. This will empower them and enable them bargain for better prices amongst the available processors. Furthermore, Ugandan dairy farmers through their national body, the Uganda National Dairy Farmers' Association are considering purchase of the largest milk factory in the country, Dairy Corporation Ltd. If achieved, they will be assured of a market and will no longer rely on milk hawkers to market their produce.

16. Critical Points in the Dairy Chain where Improvements can be effected to Improve Quality and Safety.

The HACCP system has been used, as an example in this section, to discuss quality and safety in the dairy chain. HACCP is a preventative approach to control food processing, distribution to ensure food safety. The system is based on a logical and comprehensive approach to raw material, process and product. Though the system takes into account of chemical, physical potential hazards, the main attention is focused on the microbiological safety of the food in this case milk and milk products.

The application of the HACCP system enables the identification of a number of points along the dairy chain that could be critical and cause health risk.

The flow would be as the following flow diagram:

Milk at the farm	* CP
Collection centers	* CP
Transportation	* CP
Raw milk reception- factory	* CP
Storage silos	* CP
Pasteurization	* CP
Packaging/Filling	* CP
♦ Refrigerated storage & transport	* CP

Note:

* Site of possible bacterial growth or contamination. **CP** - Control point

At the Farm

Sources of contamination are mainly from the shed, the person that milks the animal, feed trough, water, milking utensils, udder cleaning cloth, feed and the cow. Ugandan dairy farmers have not reached a level where they can keep the initial bacterial load in milk from a healthy cow to a minimum. There is a high risk of contamination from the sources mentioned above during milking and milk handling at the farm. It has been established that the bacterial load in milk produced in Uganda is high normally more than 300,000cfu per ml. Many times the farmer uses the same udder cleaning cloth for all milking and many do not use milking salve. Traditionally they use the froth forming on the milk in the bucket to moisten the teats. This results in contamination of the milk. Furthermore because of the prevailing environmental conditions on the farm, the udder has to be washed prior to milking and this in another major source of contamination. Some farmers abuse the specified withdraw period for veterinary drugs hence offering contaminated milk for sale. Others use unhygienic containers during milking and transportation of milk. Training of the farmers and the personnel engaged in milking would greatly improve this.

Milk Collection Centers

At the milk collection centers, milk must be cooled to a temperature below 4°C to deter the growth of spoilage bacteria and pathogens. In case of power failure, the collection centers should have a stand by generator to maintain the cold chain. Coolers must be well maintained so as to be able to cool the milk in as short a time as possible. A slight increase in temperature by 10°C would result into logarithmic growth of bacteria therefore temperature must be monitored using a thermometer and records should be kept. Many milk collection centers recently set up upcountry do not have standby generators and those that have may sometimes find themselves out of fuel to run the generator due to the prevailing high fuel prices. Others use tree shades as milk pick up points which exposes milk to ambient temperatures. In addition, the personnel and traders manning the centers have no technical skills in both quality control and maintenance of the milk coolers. Others add chemicals like hydrogen peroxide, sodium bicarbonate and potassium dichromate to prolong the life of milk; add starch to increase density and water to increase volumes in order to earn more profits.

Good hygiene practice is important to ensure that the initial microbial load on the milk equipment is very low to avoid adverse contamination. This can be done by proper cleaning and disinfection procedures. Personnel should be sent for medical check up, maintain personal cleanliness, be provided with protective gears and be trained on how to clean, type and concentration of detergents and chemicals. In addition the premises should be of acceptable standards set by DDA so as to reduce on the levels of contamination. In Uganda although many are trying to adhere to the set standards more work needs to be done.

Transportation.

Most of the milk collection centers are located long distances from the urban centers and the roads leading to these areas are rough. This therefore greatly affects the time taken during transportation of milk. Many times vehicles transporting milk end up delaying on the way and milk that had been cooled to less than 4°C starts warming. This is especially so during the rainy season when the roads are impassable. In Uganda it is only the DCL that owns milk tankers. In most cases milk is transported on open pick-ups, in unhygienic containers and the bumpy roads provide thorough agitation. Considering the distances traveled it is inevitable that the temperature of the milk rises In addition, the milk being transported is prone to adulteration and because of the lack of piped water; the sources of water used in adulteration may not be very clean.

Government should address the poor roads issue. Some of the milk in the country that is transported on open pick-ups should be transported in load tankers, which can maintain the required low temperatures achieved at the milk collection centers in order to minimize contamination. Installing of security seals can solve the problem of adulteration.

Reception at the Factory

There are very few qualified dairy technologists in the country therefore some processing companies do not have trained personnel to implement the basic food quality management systems. At the reception point personal hygiene of the personnel manning the reception, sampling equipment & technique, milk handling (time management, temperature abuse), cleaning and sanitation of handling equipment is still a problem. Training in personal hygiene, how to sample and carry out platform tests, milk handling (time/ temperature management), cleaning and sanitation of handling equipment would be of great help.

Storage Silos.

In case of large-scale processors if the silos are not cleaned properly they can be a source of contamination. However, in the case of Uganda where the bulk of the milk is through the informal sector, the silos do not exist. Instead milk is kept in jerry cans or metal cans until it is bulk pasteurised. This is on a first come first served basis. Procurement of large capacity bulk pasteurizers and/or increasing the number of bulk pasteurizers would greatly alleviate the problem. In addition, acquisition of coolers at the bulk pasteurization units could also help. Training of the owners and people manning these units would enlighten them on the problem. The DDA has made efforts in this direction.

Pasteurization

The heat treatment process must fulfill the recommended parameters (temperature and holding time) to succeed in lowering the level of microorganisms in milk. However, milk in Uganda has many times failed the test including UHT milk. Extra care would have to be taken at bulk pasteurization units where the procedure is manually controlled. Training in GMP would go along way in addressing this problem.

Packaging/Filling

This can be a source of recontamination of the already pasteurized milk. This is especially so in the informal market as milk is packed in the containers that carry it to the center. The cleaning of the cans may not be thorough thus recontamination as well as adulteration is highly likely. Use of improper packaging material may also lead to recontamination. In some cases the milk is packaged manually using measuring jugs. The hands of the operators, the milk measuring jugs and the packaging material may serve as source of recontamination. This is quite common in the informal sector.

Refrigerated Transport and Storage

Lack of refrigeration for the packaged milk will result in spoilage. In most cases in Uganda both processed and unprocessed milk is transported in non-refrigerated vehicles to the point of sale and is sold from the roadside or shops where there are no refrigeration facilities. Efforts should be made to increase refrigerated transport and storage facilities countrywide.

17. Recommendations on How to Reduce Post-Harvest Losses of Milk and Dairy Products.

Technology Transfer

- The market in Uganda is small and fragmented. Poverty and weak purchasing power prevails in the country. For most consumers, choice of the product is dictated by price not quality. There is need therefore to explore use of low-cost production, processing and packaging alternatives that can be afforded by the majority of the population.
- At the production level, appropriate stocking rates should be encouraged to avoid environmental degradation. Government, NGOs and development partners should assist in the construction of valley dams along the 'cattle corridor', to minimize on environmental degradation resulting in overcrowding of livestock in one area which would in turn encourage appropriate stocking rates. In addition, a suitable policy environment should be established to promote the delivery of veterinary services to dairy farmers.
- Promotion of small-scale rural based dairy processing plants should be supported. This will help in prolonging the shelf life of milk. These may also prove to be more profitable and manageable than the large processing plants that are operating below capacity.
- There is lack of capital to invest in new cheap technologies. DDA and other relevant organizations and private sector should promote milk bulking, hauling and/or processing facilities near areas where comparative advantage exists. Such potential should particularly be exploited for the southwestern region.
- Use of low cost processing plants with designs that increase flexibility & allow maximum utilisation of resources should be encouraged. Poor plant and processing design leading to cost-inefficient production has to be addressed. Many of the imported plants were designed for production in the developed countries where market is not a problem. Proper plant design (re-design) to increase flexibility in production output and/or to utilization of resources fully, thereby avoiding unnecessary overheads may be necessary. This may be in form of being able to increase capacity utilization when demand is boosted and production of alternative products when demand is low.

Training

- There is need to train stakeholders at various levels to create a harmoniously operating system along the entire chain from primary production to consumption. At the farm level there is need for training in management of dairy farms as business enterprises. This will enable farmers take farming seriously in order to be able to reap more from the enterprise.
- There is inadequate management capacity in the dairy sector. Skilled human resource is greatly lacking to man both the small and large scale dairy industry programmes. There is need to carry out a training needs assessment for the sector and consequently to address the need. The Government, DDA, NGOs and the private sector have to prepare training courses specially targeting the various levels along the production chain. There is also need to train dairy farmers in management of dairy farms as business enterprises. Government, DDA and relevant NGOs may facilitate the training.

• In order to address the poor quality of raw milk there is need to integrate quality assurance across the entire production chain. Training of personnel in GMP at all levels of the chain should be encouraged. The DDA should be more vigilant in monitoring quality of milk and dairy products and the culprits should be reprimanded accordingly.

Information Platform.

- There is need to qualify and quantify the post harvest loss in the dairy sector. A baseline study to assess the situation would therefore be very useful in understanding the causes as well as formulating interventions where necessary.
- The current commercial interest rates offered are too high for the farming community. Interest friendly credit facilities should be extended to small-scale farmers and processors to assist in further developing their farms and business enterprises.
- Most of the operators in the small-scale and to a large extent the large-scale processors operate with very little capital and have no access to reasonably cheap credit facilities. Government and NGOs should consider availing credit facilities for to the above-mentioned because they are instrumental for the implementation of PMA in relation to the dairy sub-sector.
- Very few marketing studies have been undertaken in the dairy industry. There is need to conduct periodic market surveys uncovering consumer demand, required packaging & affordable price. This should be addressed by stakeholders including DDA, NGOs and the private sector at large as it will yield a lot of useful information that will enable them address the market needs thus rendering them relevant. This may require undertaking market surveys that will uncover for each region, what the stakeholders' demands are, why there is demand, and what price and packaging is required.
- There has been very little promotion of milk consumption leaving the playfield to substitute products. DDA and the private sector should prepare and launch campaigns to educate consumers on the benefits of consuming milk and the various dairy products. Furthermore, there is need to improve the internal distribution network and ensure that cold storage, appropriate transport and handling equipment is available along the chain.
- There is need to regulate marketing channels in order to have a level playing field for all participants.

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