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List of Abbreviations and Acronyms

ADB	African Development Bank
AGI	Africa Growth Initiative
AI	Artificial Insemination
ASDSIP	Agricultural Sector Development Strategy and Investment Plan
ASERECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASPS	Agricultural Support Programme Services
BoU	Bank of Uganda
DB	Data Bank
DC	Dairy Corporation
DCL	Dairy Corporation Limited
DDA	Dairy Development Authority
EAC	East African Community
EADD	East Africa Dairy Development
ECAPAPA	Eastern and Central Africa Programme for Agricultural Policy Analysis
ERP	Economic Recovery Programme
EPRC	Economic Policy Research Centre
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
GDP	Gross Domestic Product
ILRI	International Livestock Research Institute
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MDAs	Ministries, Departments and Agencies
MoFPED	Ministry of Finance Planning and Economic Development
MoH	Ministry of Health
NAADS	National Agricultural Advisory Services
NAGRIC	National Animal Genetic Resource Centre
NARO	National Agricultural Research Organisation
NDA	National Drug Authority
NDAFCU	Ntungamo Dairy Farmers Co-operative Union
NDP	National Development Plan
NGO	Non-Government Organisation
NSDS	National Service Delivery Surveys
NUSAF	Northern Uganda Social Action Fund
PE	Public Enterprise
PERD	Public Enterprise Reform and Divesture
PMA	Plan for Modernization of Agriculture
PRDP	Peace Recovery Development Plan
SALL	Sameer Agricultural Livestock Limited
UBoS	Uganda Bureau of Statistics
UCCCU	Uganda Crane Creameries Cooperative Union
UDPA	Uganda Dairy Processors' Association
UHT	Ultra High Temperature
UNBS	Uganda National Bureau of Standards
UNDFA	Uganda National Dairy Farmers Association
UNDTA	Uganda National Dairy Traders Association
UNHS	Uganda National Household Survey
UNPS	Uganda National Panel Survey
USAID	United States Agency for International Development
UVA	Uganda Veterinary Association
WHO	World Health Organisation

Executive Summary

Transformation

The Dairy sector in Uganda has responded positively to agricultural sector liberalisation policies that took effect in the 1990s. Total national milk production has grown from 460 million litres in 1990 to 1.6 billion litres in 2011, with per capita milk consumption growing from 16 litres in 1986to 58 litres by 2010. A variety of dairy products that were previously imported are now being produced locally in the country. Driven largely by dairy, the livestock sector has maintained positive growth rates averaging 3 percent per annum compared to the declining (and often negative) growth rates registered in the food and cash crop sub sectors.

Milk production increased primarily from growth in cattle population, and secondarily from adoption of higher milk yielding cattle. While milk production remains concentrated in the Western milk shed, there is evidence of dairy activities spreading to other non-traditional milk producing regions of the country especially in the Central and Eastern regions of Uganda. Development of the value chain in the dairy sector has led to employment creation and income generation not only for about 700,000 dairy farming households, but also for farm input dealers, dairy equipment dealers, dairy ingredients dealers, raw milk traders, milk transporters, mini-dairies, large scale milk processors, and distributors.

Enablers

The raw milk market has gradually undergone transformation from a government controlled marketing system to a more competitive sector in which private traders and processors play an increasingly active role. Private sector businesses, cooperative societies and non-government organisation (NGOs) such as Send a Cow, Land O'Lakes and Heifer international have become active players in the supply of essential inputs, crossbreeding and veterinary extension services. These players complemented the limited role of government in those activities and ushered in new services. Farmer-to-farmer consultations enabled the flow of market information on essential inputs and product markets as well as adoption of technology. In addition to expanding milk processing plants, private milk processing companies that entered the industry after the reforms have invested in the milk collection and marketing infrastructure.

Remaining Challenges

Despite the progress, a few challenges remain.

1. Regional milk markets are not well integrated. Consequently, farm gate milk prices are perpetually low in the milk surplus Western region and high in the milk deficit regions (Eastern and Northern).
2. The near-monopolistic structure of the milk collection and processing market – where Sameer Agricultural Livestock Limited (SALL) inherited existing networks created by the government owned Dairy Corporation (DC) after privatization and as a result controls 78 percent of the formal raw milk marketing channel – leaves major processing companies such as GBK and SHUMUK with little incentive to invest in infrastructure.
3. SALL sets periodic raw milk prices and milk purchase quotas during peak season, a practice widely construed as monopoly tendencies by dairy farmers in the Western region. The low farm gate price offered to farmers especially during the peak season in relation to the increasing prices of imported inputs (e.g. veterinary drugs and acaricides) is a big source of instability in the milk surplus south-Western region, and dairy farmers in this part of the country are

switching enterprises from dairying to crop farming. For instance dairy farmers in Bushenyi district (south Western region) have diversified to tea and banana farming.

Recommendations

1. Public investment in infrastructure development like roads and electricity is necessary to support integration of the raw milk market between regions. This will make the milk market more efficient.
2. The Dairy Development authority (DDA) needs to review the existing excesses in the formal marketing of raw milk to check SALLs extreme marketing behaviour. This would involve allowing strong farmers' cooperative unions to fully participate in management of milk collection infrastructure, leased to SALL by government.
3. Promotion of public private partnerships (PPP) arrangements to expand the milk collection network where other processors have failed to invest.
4. Mini-dairies organised and managed through farmer groups (cooperatives) as exemplified in the Northern and Eastern regions can augment the level of participation of dairy farmers deeper in the value chain. This model should be encouraged to further utilize processing capacity.
5. Strengthening farmer groups as institutions central in the dissemination of information at farm level, and the revival of cooperatives by Government as highlighted in the agricultural DSIP.

The objective of this study is to put together information on lessons that policy makers and development partners alike could learn from the dairy sector in promoting growth of other agricultural value chains.

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1. Introduction

Uganda has made some visible achievements in terms of economic performance in the last two decades. The country has attained impressive GDP growth rates averaging about 7 percent per annum since the 1990s. Despite the impressive overall economic performance a critical look at the sectoral composition of GDP shows that growth has not been robust in some sectors (see Table 1). Overall growth in agriculture has been slow compared to that of industry and services, and these fast growing sectors are weakly linked to the agricultural sector. Yet, the agricultural sector remains the main source of employment to nearly 66 percent of Uganda's labour force (MoFPED, 2011/12); and a key sector in Uganda's poverty reduction drive (Ssewanyana and Okidi, 2007). The poor performance of agriculture led many critics to argue that the sector has responded negatively to the reforms[1]. But within the agricultural sector, Table 1 reveals that the livestock sub sector has maintained positive growth rates, averaging 3 percent per annum, and this performance is partly driven by the dairy sector. Dairy contributes about half of the total livestock GDP, which in turn contributes nearly 20 percent of the total agricultural GDP (BoU and PMA, 2009; Ministry of Tourism, Trade and Industry (MTTI), 2007).

Table 1: Trends in GDP Sectoral Growth Rates, 2001-2011 (%)

	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
Total GDP	8.6	6.6	6.8	6.3	10.8	7.9	9.8	7.2	5.5	6.3
Agriculture	7.1	2.1	1.6	2.0	0.5	0.1	0.7	2.5	2.4	0.9
- Cash crops	12.5	3.2	7.3	-5.5	-10.6	5.4	2.2	5.6	-1.1	-15.8
- Food crops	5.7	2.2	-1.5	-0.2	-0.1	-0.9	2.4	2.6	2.7	2.7
- Livestock	4.0	3.5	4.7	3.0	1.6	3.0	3.0	3.0	3.0	3.0
- Forestry	6.8	5.2	3.1	6.5	4.1	1.9	2.6	6.3	2.9	2.8
- Fishing	13.8	-4.3	9.6	13.5	5.6	-3.0	-12.6	-7.0	2.6	0.4
Industry	7.4	9.5	8.0	11.6	14.7	9.9	6.4	5.8	6.5	7.5
Services	11	7.4	7.9	6.2	12.2	8.8	13.0	8.8	7.4	8.0

Source: MoFPED (2008/9; 2011/12) Background to the Budget reports

Uganda's potential for livestock production in general, and dairying in particular given the abundant land area, fertile soil, favourable temperatures, and high annual rainfall, need not be over-emphasized (Staal and Kanguongo, 2003). Milk–producing (dairy) cows are regarded as the most valuable and potentially profitable asset for a Ugandan farm family to own. They provide families with a dependable flow of cash, producing income from milk for substantial periods of the year with minimal delay between milk sale and receipt of income (BoU/PMA, 2009). Indeed, the country's economic development initiatives[2] identified the dairy sector as a priority sector to be promoted to meet the local milk demand and become competitive to exploit the export potential (Elepu, 2006). Analysis of the 2008 National livestock census shows that a quarter of Ugandan households (nearly 1.7 million) own cattle and estimates the national cattle herd to be 11.4 million (MAAIF, 2010). In terms of cattle breeds, 93 percent of households own indigenous cows while the rest own either

1 This impressive economic performance is largely attributed to the economic reforms that took place since the early 1990s following periods of economic mismanagement and civil strife. The economic reforms were directed towards economicstabilisation andliberalisation, backed by preferential funds donor institutions and governments. The reforms included the privatisation of state owned enterprises, elimination of marketing boards, currency and exchange rate reforms, tax reforms etc.

2 The Uganda Agri-business Development Components (ABDC) within the mandate of the Agricultural Support programme Services (ASPS). The Uganda National Export Strategy 2008-2012 of the Ministry of Tourism, Trade and Industry (October, 2007).

exotic and/or cross breeds. Although there are a limited number of commercial dairy farms with large herds of exotic dairy cows (Holstein-Friesian, in particular), the bulk of milk production comes from small mixed farms (with crop and livestock combined) where some milk is consumed on the farm (World Bank, 2009). A significant proportion of milk production also comes from zero-grazing units – where cows are kept in stalls and fed in-house with cut grass– that are suited to farmers with only small land holdings. Women keeping between one to three dairy cows in a stall make up a significant proportion of these farmers (World Bank, 2009).

The dairy sector is one of the few sectors where the concept of value addition has been successfully adopted.[3]A growing dairy sector has major implications for income generation and poverty reduction not only to those households that depend on dairy directly, but also to the value chain actors (farm input dealers, dairy equipment, dairy ingredients dealers, raw milk traders, milk transporters, small/ medium/ large scale milk processors, distributors etc.). Growth in milk production, processing and consumption has re-fuelled growth in the formal[4] dairy sector — a sector that nearly disappeared after the collapse of the Uganda Dairy Corporation (DC). However, informality still dominates the sector (Salasya et al., 2006) with nearly 80 percent of the total milk marketed sold through the informal sector in an unprocessed form. In 2006 the dairy industry was worth US$ 268 million with the informal sector contributing US$160m (Thomson, 2006). This fact notwithstanding, the formal dairy industry is one of the fastest growing agricultural sub-sectors in Uganda.

It is against this background that this present study documents the agricultural sector reforms since the 1990s and how they have supported the transformation of the dairy subsector. Specifically, the study sought to identify the agents of change (key *actors*) in the transformation process of the dairy sector along the milk value chain. This study also identifies obstacles or challenges, if any, that might have impeded the transformation of the dairy sector. Lastly, the study seeks to articulate short term and long term policy options for improving the dairy industry in Uganda.

3 The most plausible explanations for this success include: first, the development of the formal dairy sector; and second, the private – public sector partnerships that have worked well to support new privately owned domestic and foreign dairy companies investing in agriculture.

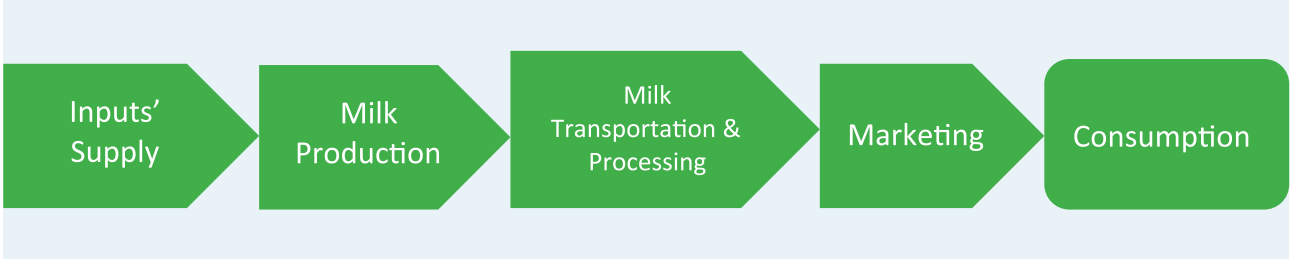
4 The formal sector refers to the section of the dairy value chain handling and marketing processed milk. While the informal, unprocessed milk.

2. Study Approaches and Data Sources

2.1 Study Approaches

The study used the commodity value chain framework to identify key players and actors that have been instrumental in transforming Uganda's dairy industry. A value chain can be complex depending on the number of actors and activities involved. However, the dairy sector value chain can be simplified as illustrated in Figure 1 (for illustration purposes only).

Figure 1: Milk Value Chain Framework



A detailed description of all the activities and roles of different players along the entire milk value chain is provided, starting from essential inputs in milk production (veterinary drugs, artificial insemination, supplementary feeds and livestock breeding) and extending to actual milk production, transportation, processing, marketing and finally consumption.

The study begins with an extensive review of government policy that impact on the dairy sector. These includes different legislations in the dairy sector like the Dairy Industry Acts of 1967 and 1998; the 1993 Master Plan for the Dairy Sector; and review of annual reports from programs undertaken by the relevant organizations and institutions. We also reviewed relevant records and reports of investors in the dairy sector. This review provides insights into the history, philosophy and operation of the programs and legislations that were undertaken and their relevant impact on the dairy sector. It also provides insights on the institutional and policy reforms undertaken by government to revamp milk production; stabilise and improve milk collection and processing in Uganda.

2.2 Data Sources

The study relies on data from multiple sources. This includes both secondary and primary data collection.

2.2.1 Secondary Data Sources

The study utilizes large household surveys data, Uganda Census of Agriculture and the Uganda National Livestock Census – all collected by the Uganda Bureau of Statistics (UBoS). The analysis was done at household level unless stated otherwise. The estimates based on these UBoS dataset were weighted to derive national and regional representation- Central, Eastern, Northern, and Western regions. These geographical regional stratifications are also of interest in understanding the Ugandan dairy sector value chain (DDA,2008; World Bank, 2009). The Western region represents the milk surplus region, the Central region provides the biggest market for milk produced in the country, the Eastern region is densely populated and intensification in dairying is widely practised. The Northern is a milk deficit region.

i) *Uganda National Household Surveys (UNHS) 2005/06 and the Uganda National Panel Surveys (UNPS) 2009/10:* These surveys are nationally representative and multipurpose by design. All rounds of survey included an agricultural module which provides information on livestock production and products at household level. The module also includes information on the source of agricultural inputs. The UNHS and UNPS panel[5]comprising unweighted sample of 2,566 farm households actively involved in the dairy sub sector provided the opportunity to analyse the changes over four years (between 2005 and 2009) that had taken place at farm level and institutional capacities developed to support the dairy sector.

ii) *Uganda National Service Delivery Surveys (NSDS) 2004 and 2008:* These nationally representative datasets capture information on changes in access to and use of inputs by dairy farmers and provides the opportunity for qualitative and quantitative evaluation of some of the changes in veterinary extension services. The components of the milk commodity value chain that changed at the inputs level and in terms of veterinary services were captured from the NSDS UBoS data sets from a sample of 1,610 in 2004 and 777 in 2008, respectively.

2.2.2 Administrative Sources

The main source of administrative data on trends in national herd was the agricultural planning department (MAAIF) Statistical Abstract 2010.Trends in annual national raw milk production from 1990-2010 were analysed using data from a number of sources. These included: Dairy Development Authority (DDA); Land O' Lakes; Economic Policy Research Centre (EPRC, 2009); and the Agricultural Planning Department (MAAIF- Facts and Figures for the Agricultural Sector, 2008). DDA also provided data that were used to analyse the reforms in milk *collection, processing and marketing*. The studies by World Bank (2009) and Elepu (2008) provided useful data on national and *per capita* milk consumption. Other sources included: UBoS Statistical Abstract and Website especially on the value of milk imports and exports.

2.2.3 Primary data collection

Field work was undertaken by the EPRC research team, during which qualitative and quantitative primary data was collected to gain a deeper understanding of the findings from the national surveys (NSDS,UNHS and UNPS), and to solicit views and opinions from the various stakeholders regarding the reforms. The primary data was collected from three regions (Western, Eastern and Northern)[6] out of the four Regions in October 2011 and February 2012, respectively. Primary data was collected from key stakeholders in the sector through key informant interviews and focus group discussions (FGDs). The value chain framework guided the collection of the data.

(i) At the *input level,* the key actors were stratified into four broad categories: - (a) Those involved in importation and distribution of breeding stock (i.e. cows and heifers), (b) Private firms involved in the importation of semen and provision of AI services, (c) Government agencies that provided livestock genetic improvement services, and (d) Input stockists of veterinary drugs and supplementary feeds. In each region data was collected using checklist during interviews conducted with *one* randomly selected key informant from each of the four categories (a), (b), (c) and (d). Therefore *four* input providers were interviewed in each region respectively, leading to a total of twelve input providers for this component in the study. Refer to Appendix B for a detailed list of input providers.

5 The 2005/06 UNHS was the base period and 2009/10 UNPS the first wave of the panel.

6 The Western region provided information on the milk value chain in a milk surplus market environment- with a fairly developed milk collection network. The Northern and Eastern provided information on the dynamics along the value chain in a milk deficit region. In addition the Northern region provided information on the effects of the post conflict period on the dairy sector.

(ii) At the *farm (milk production) level*, *five* focus group discussions (FGDs) were conducted in each of the four statistical regions (Western, Eastern, Northern), from three selected districts in each region (refer to Appendix B for the list of FGDs in each region). The selection of the districts was guided by information on farm group formations (farmers' dairy cooperative societies) provided by DDA field staff in a consultative meeting prior to field work. The FGDs were organised while taking into account farmers active in the formal (organised cooperatives) selling milk to processing companies), and those that sell milk through the informal channels directly to vendors, milk hawkers, and consumers. The main reason for conducting FGDs from the two groups of dairy farmers was that both groups represented important segments of the milk marketing channels. Selection of the cooperative societies was based on functionality and effectiveness of the cooperatives. Additional information was collected from the key informant interviews with the respective leadership of the Unions and primary farmers' associations (refer to Appendix B for the list of Key informants in each region).

iii) At the *milk collection/transporters level*, data was collected from key informants (officials) selected from two *purposely selected* milk collectors and transporters located in the main towns in the districts in each Region. It was difficult to identify specialized milk collectors/ transporters *per se* in the dairy value chain, therefore the few that were interviewed (refer to Appendix B for the list of milk collector and transporters) were selected with guidance from the district production and commercial offices.

iv) Studying the downstream *milk processing and value* addition activities was critical to the study. The management of three milk processing plants – Paramount Dairies Limited, Shumuk and GBK Dairy Products - were interviewed in the Western region. In the Eastern region, key informants were drawn from Dutch Farm and Eastern Dairies (Mbale district), White Nile (Jinja/Kamuli district) and Soroti Dairy Limited (Soroti district). Information was collected from operators of milk kiosks in both regions.

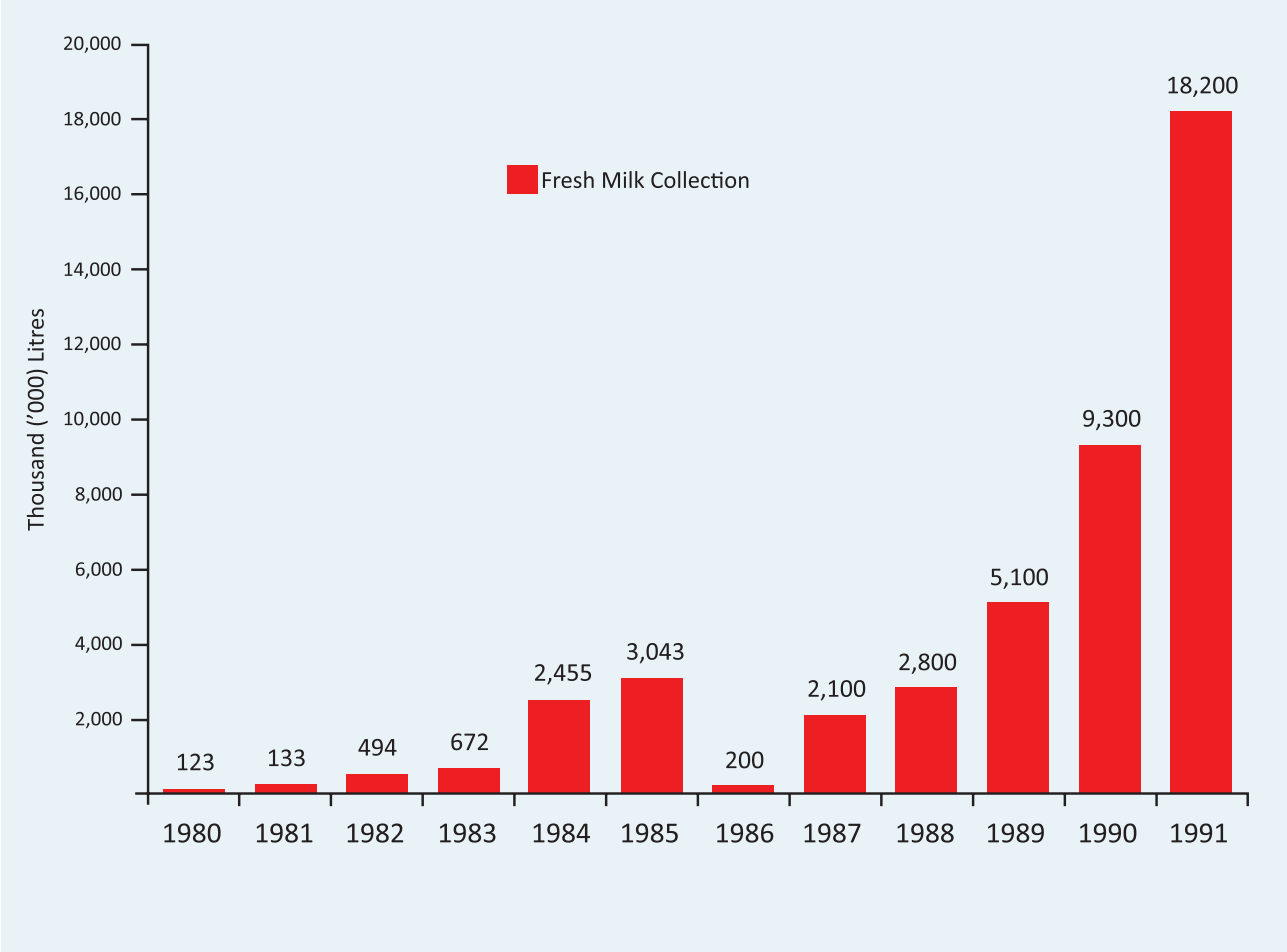
v) *Retailers* that sell unprocessed milk directly to consumers were also interviewed. These were selected from the major towns under the guidance of the district commercial officers. From each town data was collected from two milk vendors. There was an exceptional case of Nebbi town where milk was sold directly by farmers to consumers (see Appendix B for a detailed list of retailers).

The primary data was used to complement secondary data. It is important to note that qualitative data collection has limitations in that it allows only small groups to be reached and must be interpreted with caution. The analysis and reporting of the study results systematically follows the milk value chain (from inputs, production, collection/transportation, processing, to marketing and consumption).

3. Historical Perspective of Dairy Sector Reforms

The transformation of the Dairy Industry in Uganda can be understood against a pre-1987 background. The most significant post-independence policy to develop the sector was the initiative to stock exotic dairy breeds (e.g. Friesian, Guernsey, Jersey and Ayrshire species) with the aim of increasing milk production (Otto *et al.*, 2004). The program paid off as milk production increased to the extent that by 1965 the sector needed to be regulated and coordinated. Consequently, the first Dairy Industry Act in 1967 was enacted and DC[7], charged with the responsibility of collecting, processing and marketing all the milk in the country, was formed. As a result, milk collection reached its peak in the early 1970's: 19 million litres were collected and per capita milk consumption reached 40 litres in 1972 (Masembe, 2003). However, following the mismanagement of the economy and civil strife that ensued in the late 1970s and early 1980s, the sector rapidly deteriorated such that by 1985, DC was dysfunctional and hardly collected 200,000 litres a year as illustrated in Figure 2.

Figure 2: Fresh Milk Collection by Dairy Corporation, 1980-1991 ('000 litres)



The poor performance of the dairy sector was partly attributed to structural problems suffered during the war that disrupted the milk collection network. More importantly, the guaranteed official fixed price system failed considerably with regard to maintaining both desired levels in milk supplies, and desired levels of aggregate dairy farm income and the income of small groups of dairy farmers that formally supplied raw milk to DC. As a result, milk collection by DC hit unsatisfactory levels, and

7 DC was mandated to play a developmental function to establish and maintain a rural infrastructure for milk collection. While the veterinary services and animal industry department of the MAAIF was charged with the provision of extension and farmer training (Master Plan for the Dairy Sector MAAIF, June 1993).

consumer prices skyrocketed (Vanegas and Akwang, 1992). The informal milk market became more dominant than the formal market via DC to the extent that by 1991, the informal market (constituted by neighbours, village markets, town, urban centres, cooperatives and traders) handled 250 million litres while the formal one through the DC handled between 20 to 21 million litres (*ibid*).

Several studies have been conducted on the Ugandan dairy sector (such as Vanegas and Akwang, 2006; World Bank, 2009). These studies in one way or the other have influenced and/or informed the reforms in the sector. To illustrate this point, the study by Vanegas and Akwang (1992) that comprehensively analysed farm level milk pricing system in the 1990s cited significant variations in average milk costs[8] by farm size. The variations were attributed to differences in capital intensity, yield, specialization, technology, herd size variability and regional differences. Yet, DC offered a fixed price per litre nationally. The study recommended liberalization of milk marketing in Uganda.

The reforms to transform the dairy sector since the 1990s were part of the broad Economic Recovery Programme (ERP)[9] adopted by the government in 1987 as a strategy to stabilize the economy and stimulate growth. Liberalization and exchange rate adjustments were key elements of the government's economic reforms to stimulate agricultural production (MAAIF, 1993). Government embraced the liberalization of markets, the termination of parastatal monopolies, and introduction of free competition under the Public Enterprise Reform and Divesture (PERD) policy framework. PERD paved way for government to reduce its direct participation in commercial activities, and DC was among the public enterprises earmarked by government for divesture (see Box 1). As such, government's role in the dairy sector (that was lacking dynamism) had to be scaled down gradually as outlined in the Master Plan for the dairy sector (MAAIF, June 1993).

Box 1: Public Enterprise (PE) reform policy framework

The Cabinet on March 1991 adopted a strategy to reform 111 (one hundred and eleven) public enterprises (PEs), categorized in 5 Classes:
Class 1 – included PEs to be 100% Government owned;
Class 2 – government was to retain majority share;
Class 3 – government had to retain minority share;
Class 4 – PEs were to be fully privatized;
Class 5 – covered PEs that had to prepared for liquidation and sale of assets
DC was originally placed in Class 2- with a condition that government may accept a minority share if a serious private investor was identified.

Source: MAAIF (June 1993)- Master Plan for the Dairy Sector

8 Average milk costs mentioned in this study by 1990, varied from Uganda shillings 251/- per litre for small dairy farms to 181/- per litre large dairy farms, and from Ug. Shs 174 per litre in Mbarara to 266/- in Luwero.

9 The ERP was funded by the World Bank and IMF. The broader 1987 ERP objectives were to: (i) promote rehabilitation and growth; (ii) to restore internal financial stability and achieve lower inflation; and to reduce the current account deficit through increasing and diversifying exports.

Table 2: Genesis of Policies and Measures Driving the Transformation of the Dairy industry

Year	Sector Policy Focus	Institutional Measures & Support Framework
1986-93	• Self-sufficiency in Dairy	• Dairy sector rehabilitation (i) Import exotic heifers and pedigree bulls ; Restocked dairy farms to provide breeding stock for up-grading the national herd; (ii) Rehabilitated the national AI services; improved animal health services, including disease control; (iii) Committed financial and personnel resources to address identified problems in the production and marketing of milk;
1993	• Rapid growth, & Need to Sustain growth • Liberalizing the milk market	• A Master Plan for Dairy sector aimed at: (i) Liberalising the milk market (ii) Creating a Board to oversee the liberalized market (iii) Privatising Dairy Corporation parastatal
1997	• Poverty Eradication	• Policy Reviews and pursue strategies that recognize the role & involvement of the private sector in production and marketing activities of Dairy products. • Acknowledges the continuing contribution of the development partners to dairy development • Poverty Eradication Plan (PEAP) with the plan to modernize agriculture (PMA):- address all agricultural constraints & shift from subsistence to modern commercial farming. • Subsequently Restructured and strengthened the national extension service through NAADS program;
1998	• Privatize the Dairy Sector	• The Dairy Industry Act 1998 was passed as a result ; (i) Dairy Development Authority (DDA) was created; to develop & regulate the dairy industry and DCL (ii) Dairy Corporation Limited (DCL):-a purely commercial Co. was created.
2000-01	• Liberalized & Privatized Dairy Sector	• DDA is established as a semi-autonomous agency of (MAAIF) under the revised Dairy industry Act, & became operational in 2000. • DCL still accounted for 64% of milk sales in 2001 (NARO, 2001). • DCL is divested to form Sameer Agriculture and Livestock Ltd (SALL).
2001-10	• Building Strong Institutional Base under DDA auspices.	• Under the Revised Dairy industry Act, 2000:- number of statutes promulgated , & DDA has been able to; (i) Enforce milk hygiene standards & quality control; (ii) All traders licensed as meeting minimum public health & milk quality Standards (e.g. 657 traders were licensed in 2006); (iii) Build strong Institutional Base Uganda National Dairy Farmers Association (UNDFA), Uganda Dairy Processors' Association (UDPA) is the apex body dairy processors (large and small); the Uganda Dairy Traders Association (UDPA) (iv) Provide training in upholding milk quality Standards; (v) Improve Quality & Safety of milk & milk products:- leading to improved access to High-value markets (Locally & Abroad)

Sources: Elepu (2006, 2007 & 2008); World Bank {2009}; EPRC (2009); Arinanye (2011)

Table 2 presents a summary of the policy and institutional changes in the dairy sector since late 1980s. The reforms in the milk sub sector that began in the early 1990s created incentives for a number of private entrepreneurs, cooperatives, and associations to enter the milk processing and marketing system in competition with the DC (World Bank, 2009). Establishment of the Dairy Development

Authority (DDA), as a full-time semi-autonomous regulatory body for the Dairy industry (inaugurated on June 1, 2000) enforced raw milk quality standards that increased private sector participation in formal milk collection and transportation (Thomson, 2006).

3.1 Dairy Sector Reforms (The Master Plan)

The *Master Plan* for the dairy sector provides detailed processes and operational framework for the establishment of competitive and liberal markets that characterise the present day dairy sector. Special emphasis was placed on the role of markets and price mechanism in directing resources along the milk value chain. The reduced role of government, particularly MAAIF and other government agencies, was outlined. Private sector finance of investments in milk production and private entrepreneurship in milk collection and processing formed the pillars to reform the dairy sector value chain. The shift in dairy sector objectives from a government controlled to a more liberal marketing system necessitated reforms in the legal and organisational framework for dairy industry, as well as the need to reform the delivery and financing of support services to the industry. Below is a brief discussion of the details of the Plan.

3.1.1 Establishment of Competitive and Liberal Markets

In the Master Plan, liberalized markets are central in directing resources to move milk from farmers through the processing stages to the consumers. This required bringing an end to the DCs monopoly. Put differently, the best way to achieve efficiency was through the promotion of competition. The vision in the Plan was for Government to:

"Establish liberal dairy markets, and promote competition in processing and marketing. The near monopoly situation which dairy corporation has in the formal market will be abolished, and farmers and their organisations as well as private investors will be invited and facilitated to participate in development of milk processing and marketing."

3.1.2 The Role of Government

Under the reform framework, government was to abandon its control and influence over DC's price setting as was exercised in the past. The 'new' commercial and privatised DC was granted autonomy to adopt a price policy based on commercial principles. The thinking was that only if prices reflect the changing cost structure of the industry (directed by supply-demand conditions) can competition arise and succeed.

Government withdrew from direct participation in milk production and in commercial processing and trade. The agreement to privatise DC was reached at the Cabinet meeting of March 1991; government was expected to concentrate its scarce resources on developing an enabling environment in which the farmers and the private sector would grow. Therefore government was relegated to playing the role of a facilitator and provider of support services. This function was to be performed through government ministries, department and agencies (MDAs) including MAAIF, Ministry of Health (MoH), Agricultural Secretariat under Bank of Uganda (BoU), the Financial Sector, Uganda National Bureau of Standards (UNBS) and the Dairy Board.

Under the new private sector led policy reforms, the main role of MAAIF was to support the industry by providing support services to farmers and training dairy technicians for the processing stages. MAAIF was to play a key role in coordinating and initiating development of the main production areas through other government agencies. For example, UNBS in close collaboration with the Dairy Board was to play a critical role in developing standards for dairy products and enforcing the laid-out standards. The UNBS was to play a critical role in analysing animal feeds to ensure that labels reflect

actual composition. On the other hand, MoH was tasked with safeguarding milk consumers against health risks. Its main role was to ensure that processed liquid milk was safe for consumption without boiling and that appropriate information was provided to consumers buying raw milk. Initially, the Agricultural Secretariat had a unit to monitor and analyse production and processing cost estimates for the purpose of advising government on agricultural prices, including milk. However, with the decision to liberalise milk prices, this unit no longer served the intended purpose to the dairy sector and was abolished. However it was recognized that the analysis of milk production economics remained important for developing appropriate advice to farmers on husbandry methods, and it was therefore proposed that the work be assigned to the small technical secretariat to be established at the Dairy Board.

3.1.3 Legal and Organisational Reforms

With the reform objectives of having markets direct resources along the milk value chain, the legal and organisational framework for the dairy industry had to be reformed. The reforms included restructuring and privatisation of DC, establishment of the Dairy Board and transfer of DC's support services to MAAIF. The legal and organisational reforms necessitated enacting a New Dairy Industry Act of 1998 to reflect the reformed organisational and policy framework for the dairy sector (see Box 2). The Act established the Dairy Development Authority (DDA) whose role was to regulate and develop the dairy industry.

Box 2: Revolution of Legal and organisational reforms in Uganda's dairy sector

Policy	(Objectives & Key requirements to achieve)

❖ The Dairy Industry Act of 1967:	• *Laid the legal framework to establish DC as a statutory body with:*
	  • Developmental;
	  • Promotional; and
	  • Regulatory functions.
	• *The Act did not require DC to operate as:*
	  • A commercial & financially self-reliant entity
	  • Contradictory to new policies on the roles of Government & the private sector in directing resource allocation in the dairy sector.

❖ Reforms	• Commercialization & privatizing DC in accordance with PERD • DC established as Ltd liability company initially 100% owned by Government • DC to pursue only commercial objectives • Development function transferred to the Dairy Board

❖ The new Dairy Industry Act of 1998	• *The new Dairy Industry Act of 1998 replaced the Dairy Industry Act of 1967*
	  • To reflect the reformed organizational and policy framework for the dairy sector;
	  • To provide for the structure and functions of the Dairy Development Authority (DDA);
	  • To provide for the promotion and control of production, processing and marketing of milk and dairy products and ;
	  • Generally to facilitate the development of the dairy Industry and for other connected matters

Sources: MAAIF (June 1993)- Master Plan for the Dairy Sector; The Dairy Act, (5th June, 1998)

3.2 Policy Initiatives to Drive Dairy Sector transformation

Government in the late 1990s put in place a number of policy initiatives to eradicate poverty through agricultural transformation. The Plan for Modernisation of Agriculture (PMA) formed the pillar in addressing all agricultural constraints and stimulating a shift from subsistence to modern commercial farming. Among others, the PMA provided for training, advocacy services and marketing. In 2004, over 40 percent of dairy farmers across all regions in the country had knowledge about PMAactivities (Table A1, Appendix A). Information on the policy direction of government in the development of the agricultural sector had trickled down to over a third of farmers involved in the dairy business (UBoS National Service Delivery Survey, 2004, Table 1A, Appendix A).

The PMA also included restructuring and strengthening the national extension services as an actionable item. Following the PMA recommendations, the NAADS was created in2001and was planned as a 25-year program with an initial phase of 7 years that ended in June 2008. The NAADS program for capacity building within the farming communities included training, institutional development through farmer groups and farmers' participation in enterprise prioritization schemes to foster utilization of advisory services. Benin *et al.,* (2007), reported that the NAADS program helped to strengthen the institutional capacity and human resource skills of many farmers to potentially demand and manage the delivery of agricultural advisory services (e.g. enterprises, technologies, practices, and information) that are likely to meet their local production and market conditions. The NAADS farmers' groups institutional development program yielded dividends by taking the lead in providing the essential information on diseases control in the dairy industry (UBoS, 2005/06 UNHS, Table 2A, Appendix A).However, the NAADS activities in the dairy industry country wide were limited in scope by 2005, and provided 1.4 percent coverage to the dairy industry in terms of livestock health enhancement information by 2005/06. The IFPRI NAADS evaluation report authored by Benin *et al.,* (IFPRI,2011) revealed that the adoption of new livestock enterprises was lower than adoption of new crops, in terms of the households adopting - between 23% and 36% households adopted a new livestock enterprise after 2000. However, the direct participation in NAADS programs had a greater average effect on livestock productivity than on crop productivity in general.

4. Inputs Sources and Market Information

This section presents a discussion on the changes in the input markets and the flow of market information on inputs within communities where dairy farming households are resident. Throughout the section, the results are presented by region because of the inherent peculiarity in dairy management husbandry practices, and differences in dairying potential across regions.

4.1 Changes in the Supply of Key Inputs

i) *Supplementary feeds*: In the NSDS surveys, households were requested to indicate the most important source of inputs for the dairy sector. The summary of responses is presented in Table 3. With a liberalised and a more open dairy sector, it can be observed that nationwide, government gradually moved away from providing supplementary feeds especially in Central and the Western milk shed between 2004 and2008[10]. The extended role of government in provision of feeds in the Eastern and Northern region during the period reflects the rehabilitation of the post-conflict Northern Uganda under the Peace, Recovery and Development Plan for Northern Uganda (PRDP), and the Northern Uganda Social Action Fund (NUSAF) I. Support from the NUSAF to the dairy sector is visible (Picture No1) in Northern Uganda. These programs had a big component of restoration of livelihoods, agriculture and livestock sub sectors that were dismantled by the 20 year LRA conflict.

The private sector (i.e. markets, shops, and local vendors) took the lead as sources of supplementary feeds in the relatively peaceful and urbanised Central and Western regions. Nearly 64 percent of the households residing in the Eastern region cited other sources as the most important source of supplementary feeds. The findings could probably be picking the gathering of fodder by farmers along the road side and in own fields for use in the zero-grazing dairy system in the region. It was evident from the fieldwork that capacity to expand forage to support and sustain dairy farming on zero-grazing units in Eastern and Northern Uganda has developed over time (EPRC Field Work, February 2012). See pictures No. 2 and 3.

1 Support from NUSAF to the dairy sector is visible in Northern Uganda

10 Before the liberalisation of the dairy sector, government's agents were the sole providers of animal drugs for tick and tsetse fly control, Artificial Insemination (AI) and exotic pedigree bulls for breeding. Generally, farmers depended mainly on natural breeding methods, and purchases of local heifers to build their herds. In terms of institutional support, input provision to the dairy sector was a domain of MAAIF, government owned Livestock Farms, and NUVITA that provided feed supplements (MAAIF, 1993).

2 Adoption of improved dairy cattle in Northern Uganda in the recent past

3 Stored forage to support and sustain dairy farming on zero-grazing units in Northern Uganda

Table 3: Sources of Inputs Important in Milk Production at Farm level between 2004 and 2008

		2004						2008					
Inputs Category		Government Agencies[1]	Private Dealers[2]	Cooperatives	NGOs	Others	Total	Government Agencies	Private Dealers	Cooperatives	NGOs	Others	Total
Feeds:													
	Central	18.7	74.8	2.4	4.1	0.0	100	6.6	80.4	0.0	3.0	10.0	100
	Eastern	11.6	80.9	0.0	3.7	4.0	100	14.2	21.9	0.0	0.0	63.9	100
	Northern	12.5	87.5	0.0	0.0	0.0	100	64.6	0.0	0.0	0.0	35.4	100
	Western	8.3	84.4	0.0	0.0	7.3	100	5.1	79.3	0.0	0.0	15.6	100
	Uganda	14.6	78.7	1.1	3.3	2.3	100	9.7	66.3	0.0	1.5	22.5	100
Veterinary Drugs:													
	Central	34.8	62.4	0.2	1.3	1.2	100	38.6	59.8	0.8	0.8	0.0	100
	Eastern	48.6	50.6	0.6	0.1	0.3	100	76.3	22.7	0.0	0.0	1.0	100
	Northern	46.1	46.2	0.2	5.2	2.2	100	67.5	27.7	0.0	4.8	0.0	100
	Western	30.3	68.1	1.0	0.4	0.3	100	32.3	66.7	0.0	0.0	1.0	100
	Uganda	40.9	56.4	0.5	1.4	0.9	100	46.7	52.0	0.3	0.7	0.6	100
Artificial Insemination:													
	Central	79.1	14.8	2.2	1.7	2.3	100	89.4	10.6	0.0	0.0	0.0	100
	Eastern	79.9	17.2	0.0	2.9	0.0	100	70.1	30.0	0.0	0.0	0.0	100
	Northern	100	0.0	0.0	0.0	0.0	100	64.0	36.0	0.0	0.0	0.0	100
	Western	76.1	15.0	8.9	0.0	0.0	100	56.8	26.6	0.0	16.7	0.0	100
	Uganda	80.3	14.3	2.6	1.6	1.3	100	75.5	19.4	0.0	5.2	0.0	100

Source: Authors' calculations based on NSDS 2004 and 2008

1 In the NSDS, UBOS categorises government agents into veterinary and agricultural officers; extension workers; DFI/agricultural and NARO research centres.
2 Private input dealers here are categorized into: local Markets, shops; and local vendors by UBOS.

ii) *Veterinary Drugs*: Farmers increasingly sought veterinary drugs (mainly vaccines) from government agencies between 2004 and2008. The transportation of any form of vaccine to the districts and the delivery of vaccines to the farmers requires a cold chain facility. The cold chain facility is expensive and its utilisation continues to be coordinated through the government district veterinary offices. The findings in Table 3 could also be picking the increasing influence of the government controlled NAADS programme in the delivery of extension services to farmers in groups. And the increasing need to vaccinate the growing numbers of dairy cows as a routine procedure against diseases likerinderpest, contagious bovine pleuropneumonia (CBPP) and brucellosis. This is possibly why by 2008, about 47 percent of dairying households countrywide reported government agencies[11] as the most important source of veterinary drugs compared to 40 percent in 2004. The rehabilitation programme partly explains the dominance of government in provision of veterinary drugs in the Northern and Eastern regions by 2008. However, the private sector remained the most frequently mentioned sources of veterinary drugs in the more stable Central and Western milk sheds.

Prior to their abolishment, the cooperatives were instrumental in enabling farmers to obtain veterinary inputs. It is not surprising that fewer households obtain such drugs via cooperatives in 2008 relative to 2004. However, there are government efforts to revive the cooperatives as highlighted in the DSIP and the recreation of the ministry in charge of cooperatives. Notably is the growing role of NGO in veterinary drugs as well as AI services (as discussed in the subsequent section) as an important source of inputs, though with a regional bias. To illustrate this point, the role of NGO in veterinary drugs seems to have dropped by 2008 especially among households in all regions with the exception of those in Northern Uganda.

iii) Artificial Insemination (AI): The dominance of government as a source of AI services is evident from Table 3. This stems from the fact that the dairy cattle AI services are based at the state controlled National Animal Genetic Resources Centre and Data Bank (NAGRC & DB). NAGRC & DB imports Friesian, Jersey and Guernsey semen free from the FAO Bovine Semen Donation Scheme. It also works in partnership with Heifer Project International (USA) and Send-A-Cow (UK) to expand the dairy breeding program countrywide through AI services. However, other private breeding firms like BRAC and World-Wide Sires import semen and provide AI services.

Information from the field work revealed that due to limited number of qualified government AI technicians especially in the distant regions (Northern, Eastern, and Western) – where government AI services are not sufficient enough and facilitation to invest in liquid nitrogen kits from the public sector to transport semen for long distances is limited, dairy farmers have increasingly resorted to private technicians/dealers who charge a fee for their AI services. This possibly explains the relatively high incidence of sourcing of AI services from the private sector in Northern Uganda (36 percent); Eastern (30 percent); and Western (26 percent), compared to the 11 percent in Central region. Despite the issues discussed below of affordability of these services especially by the poor households, there is growing participation of the private sector in the provision of AI services from 14.3 percent in 2004 to 19.4 percent in 2008, national average.

11 Vaccination programs against diseases such as rinderpest, contagious bovine pleuropneumonia (CBPP) brucellosis, blackquarter, anthrax, foot and mouth diseases (FMD) among others continue to be carried out and coordinated through the government district veterinary offices. These precautionary measures are required when there is a pending epidemic and are too expensive to be managed on individual dairy farm level.

Likewise, NGOs continued to support the AI breeding programs in the Western region with about 17 percent (see Table 3) of dairy households citing NGOs as a source of AI services. Information gathered during field work reveals that NGOs like Send a Cow and Heifer project intensified AI services in the region[12] to create a domestic hub and a source of in calf-heifers for other regions. On the other hand, information gathered during field work revealed that the potential of cooperatives to extend input credit to its members remained rather unrealized due to the weak financial capacity of most dairy cooperative societies. The private sector is emerging to take advantage of the untapped market – that is, un met demand – for inputs. Such private firms include: Coopers (Uganda) Ltd., Quality chemicals, Norbrook; Eram that have come in to fill the gap for animal supplementary feeds and drugs. Institutions like Uganda Veterinary Association (UVA) have increased the supply of inputs in the dairy sector countrywide.

Box 3: Sources of inputs – Information from the fieldwork

Interviews with Key informants and Focus group discussions (FGD) with farmers from the Districts of Mbarara, Shema, Ntungamo and Bushenyi in South-Western Uganda, Kamuli/Jinja; Mbale; Bududa/Sironko; and Soroti/Ngora in Eastern Uganda and Gulu, Apac and Nebbi in Northern Uganda conducted between October 2011 and January 2012 revealed that:-

- Breeding stock before liberation was mainly sourced from government agencies. However, after liberalisation of the dairy industry, breeding stock is mainly sourced from fellow farmers (private) in addition to NGOs like Send a Cow and Heifer Project. Government agencies through MAAIF were noted to provide minimal support as regards access to seed stock.
- Supplementary feeding: was generally not adopted before liberalisation of the industry mainly due to the predominantly extensive grazing system practiced. The main sources of supplementary feeds are private entrepreneurs, NGOs and co-operatives.
- Veterinary drugs and chemicals (acaricides): Before liberalisation of the dairy sector veterinary drugs and chemicals were mainly sourced from government agencies and private providers. With the liberalisation of the industry, co-operatives and the private sector have taken a leading role in the provision of veterinary drugs and chemicals.
- AI services: Before liberalisation of the dairy sector, AI services were provided and monitored by responsible government departments. After liberalisation, individual private technicians have taken the lead in the provision of AI services. However, the semen used is still mainly provided by government departments and private companies such as; World Wide Sires and BRAC.

Source: EPRC (October, 2011 and February 2012) Field Work

The key messages from this section of the study on changes in input supply, brings to light the fact that under a liberalised dairy sector operating environment a number of agents – private sector businesses, cooperative societies, and non-government organisation (NGOs) seized opportunities to setup enterprises and institutional networks to supply essential inputs and veterinary extension services demanded by a growing and more dynamic dairy sector to compliment the core government public veterinary inputs and extension services. This puts in perspective that the dairy sub sector is changing in many ways for both producers and for the institutions that serve them, including extension. The participation of farmers in these new economic relationships demands new skills and knowledge, new communication networks among like-minded producers (Swanson, et al, 2001).

12 The Western region has fairly developed private farms with the capacity and potential to be used to be used as breeding centres.

4.2 Sources of Market Information on Inputs

The NSDS requested households to give their perceptions on the changes regarding source of information on inputs retrospectively. The changes are ranked on a scale ranging from 1 *'where market information services had improved'* to3*'where information services had worsened.'* The rates are self-reported and are generated from a survey question soliciting qualitative data on how households rated changes in market information services within the community in the last 2 years in the 2004survey and last 4 years in the 2008 survey. The results are presented in Table 4.

A significantly higher share of households was more likely to report improved market information on veterinary drugs than either feeds or AI. Households residing in the Northern region were more likely to report stagnation in AI service compared to their counterparts in other regions. The flow of market information on supplementary feeds and artificial insemination (AI) services between 2002 and 2008 across in communities located in Central and Eastern regions had remained relatively the same. Communities in Western region felt that some improvements had occurred in the flow of market information on supplementary feeding and AI services. This could be linked to the relatively strong farmers' cooperative societies within the region compared to the rest of the regions.

Table 4: Households' perceptions on changes in market information services in Communities (%)

	Survey round 2004				Survey round 2008			
Input category	**2004 compared to 2002**				**2008 compared to 2004**			
	Improved	**Same**	**Worsened**	**Total**	**Improved**	**Same**	**Worsened**	**Total**
Feeds:								
Central	39.7	52.4	7.9	100	45.5	51.8	2.7	100
Eastern	35.3	55.4	9.3	100	24.1	68.9	7.0	100
Northern	22.3	71.1	6.6	100	58.6	41.4	--	100
Western	42.1	52.3	5.6	100	56.3	43.7	---	100
Uganda	35.2	56.9	7.9	100	45.0	52.3	2.7	100
Veterinary drugs:								
Central	51.0	43.3	5.7	100	66.5	33.5	---	100
Eastern	50.0	43.1	6.9	100	71.4	28.6	---	100
Northern	38.1	58.8	3.1	100	77.4	22.6	--	100
Western	50.1	42.9	6.0	100	71.0	29.0	---	100
Uganda	48.1	46.1	5.8	100	70.0	30.0	--	100
Artificial Insemination (AI)								
Central	35.0	55.7	9.3	100	50.6	49.4	---	100
Eastern	30.0	57.7	12.3	100	37.2	62.8	---	100
Northern	19.4	73.0	7.6	100	18.9	81.3	--	100
Western	38.3	57.3	4.4	100	52.0	48.0	---	100
Uganda	30.8	59.7	9.5	100	43.8	56.2	--	100

Source: Authors' computations based on NSDS 2004 and 2008.

Table 5: Changes in the most important source of market information on inputs (%)

	2004							2008						
Input category	Radio	TV	Newspaper	LC Officials	Other Farmers	others	Total	Radio	TV	Newspaper	LC Officials	Other farmers	others	Total
Feeds:														
Central	37.5	1.9	0.0	11.1	43.5	6.1	100	15.3	0.0	0.0	0.0	83.1	1.6	100
Eastern	38.3	0.1	0.7	15.5	40.1	5.3	100	16.1	0.0	0.0	10.3	63.3	10.3	100
Northern	32.2	0.0	0.7	16.8	48.7	1.6	100	21.8	0.0	0.0	6.4	46.3	25.5	100
Western	62.7	0.0	0.0	4.3	30.2	2.8	100	18.9	0.0	1.6	6.6	73.0	0.0	100
Uganda	41.2	0.5	0.4	12.7	40.7	4.5	100	16.9	0.0	0.4	4.2	73.5	5.0	100
Veterinary drugs:														
Central	31.3	1.7	0.0	12.8	44.1	10.2	100	11.8	0.0	0.0	1.5	79.1	7.6	100
Eastern	31.9	0.2	0.8	15.6	47.1	4.3	100	11.5	0.0	0.0	17.2	52.2	19.2	100
Northern	20.1	0.0	0.4	21.0	55.5	3.0	100	20.2	0.0	0.0	11.3	64.3	4.2	100
Western	52.5	0.0	0.7	4.5	39.6	2.8	100	8.0	0.0	0.7	2.8	87.3	1.1	100
Uganda	33.5	0.5	0.5	13.8	46.5	5.2	100	11.2	0.0	0.2	6.1	75.0	7.5	100
Artificial Insemination:														
Central	35.7	1.9	0.0	13.9	40.9	7.6	100	17.5	0.0	0.0	11.6	68.6	2.3	100
Eastern	42.2	0.1	0.6	13.2	38.2	5.7	100	14.9	0.0	0.0	23.6	49.5	12.0	100
Northern	32.7	0.0	0.4	18.6	46.4	1.9	100	11.4	0.0	0.0	30.8	57.9	0.0	100
Western	60.2	0.0	1.1	2.7	33.5	2.5	100	24.3	0.0	3.3	13.4	53.6	5.5	100
Uganda	42.1	0.6	0.5	12.4	39.4	5.1	100	17.6	0.0	0.7	17.5	58.6	5.7	100

Source: Authors' calculations based on NSDS 2004 and 2008.

Households were further asked to name the most important source of information on the inputs (Table 5). It is evident that the role of traditional ICT (radio) declined over time. This could partly be explained by the fact that people are more attracted to the FM radios because they address topical issues which are however not developmental.

Notable is the growing importance of farmer-to-farmer consultations accentuated by the NAADS initiatives, was instrumental for the development of the dairy sector. The farmer to farmer extension linkages is probably explained by the fact that dairy farmers are looking for demonstrated evidence on the efficacy of the inputs given the underlying livestock health risk and costs associated with loss of income that could emanate from using fake (counterfeit) and or poor quality inputs especially vet drugs. Therefore fellow farmers in the dairy farming business would provide a trusted channel of information on inputs. Toro and Place (2004) also established that dairy farmers relay on other farmers as their main source of advice in such circumstances. Information flow is quite critical in the dairy industry and one option lies in strengthening the farmer groups as an institution in driving the sector for information dissemination, and the revival of cooperatives by Government as highlighted in the agricultural sector development strategy and investment plan (DSIP).

A comparison of sources of market information between inputs reveals a sizeable percentage of dairy farmers reporting local council (LC) officials as the third most important source of information on AI services especially in the Northern and Eastern regions. The LC officials are important in the mobilization of farmers especially through community training sessions on the benefits of AI in dairy farming. The field work findings reveal that NGOs are increasingly coming up as the main source of information on inputs used in the dairy sector. The NGOs including Send-A-Cow, Heifer International, Land O'Lakes have played an integral role in rehabilitating and developing the dairy industry in Uganda (FAO, 2011).The NGOs have had insurmountable positive impact on capacity building, bridging the gap especially in breeding and farmer groups' institutional development. However, NGOs tend to operate short-term interventions independent of existing structures of the local network of the line ministry (MAAIF).

Results here depict a general decline in access to information through traditional FM radio. The radio and mass media at large had a reach effect to dairy farmers ranging between 18 to 25 percent. Radio programs managed by established farmer groups in liaison with local veterinary technical staff could be an integral source of information on appropriated dairy cattle husbandry methods and diseases control in each region to have greater impact.

4.3 Actors and Changes in Veterinary Extension Service Delivery

The results in Table 6 reveals that the dairy industry still depended on the technical support provided by the government's veterinary staff from (MAAIF) in 2008. The threat of the outbreaks of livestock diseases[13] sometime require extensive vaccination undertakings, and restrictions of livestock movements (quarantines), coordinated through the government district veterinary offices. This explains the strong presence of government as a major source of veterinary extension services. The private sector is reported to be the next important source of vet extension services, especially in troubleshooting animal husbandry requirements that arise on a farm to farm basis.

There is a notable rise in importance of NGOs and community based organization (CBOs) especially in the Northern region. NGOs together with CBOs supported 12 percent of dairying households in

13 Most parts of Uganda are endemic to diseases like; contagious bovine pleuropneumonia (CBPP) brucellosis, blackquarter, anthrax, foot and mouth diseases (FMD).

the industry up from 6 percent in 2004, scaling down the importance of government and the private sector as sources of veterinary extension services. This period corresponds with interventions from NGOs like Land O' Lakes, Send-A-Cow, which were mentioned during the FGDs (EPRC field work). About 12 percent of dairy farmers in the Western region reported farmer groups as providers of veterinary extensions services. The importance of farmer groups was almost negligible among households in other regions. This phenomenon is linked to the fact that primary dairy farmers' cooperative societies are stronger in the Western region (EPRC Field Work, October, 2011).

Table 6: Sources of Veterinary Extension Services (%)

Region	2004					2008					
	Gov't	*Private*	*NGO /CBO*	*Other*	*Total*	*Gov't*	*Private*	*NGO /CBO*	Farmer Groups	Other	*Total*
Central	65.5	28.6	5.8	0.0	*100*	54.9	31.5	10.3	1.9	1.4	100
Eastern	65.4	29.7	4.2	0.7	*100*	64.2	22.9	9.8	0.0	3.1	100
Northern	53.2	36.1	9.6	1.0	*100*	62.8	18.6	18.7	0.0	0.0	100
Western	67.1	21.7	5.3	0.0	*100*	56.1	17.6	14.0	12.3	0.0	100
Uganda	62.5	30.8	6.3	0.5	*100*	58.2	25.1	11.9	3.4	1.4	100

Source: Authors' calculations based on NSDS 2004 and 2008.

Households were further requested to indicate the channels through which they were able to access information on veterinary extensions services. The majority reported joint meeting with extension staff and an upward trend is observed over time. This extension delivery method had generally been embraced across all regions (from 34 percent in 2004 to 49 percent in 2008) among dairying farming households countrywide. This is attributed to the paradigm shift in extension service delivery away from focusing on individual farmers to farmer groups in the mentioned period under NAADS program.

Table 7: Households' channels of accessing veterinary extension services (%)

	2004					**2008**				
Region	Mass Media	Joint Meeting with Extension Staff	Individual Meeting with Extension Staff	Others	*Total*	Mass Media	Joint Meeting with Extension Staff	Individual Meeting with Extension Staff	Others	*Total*
Central	23.3	36.5	27.0	13.2	*100*	16.2	44.9	21.6	17.3	*100*
Eastern	36.7	31.7	22.7	8.9	*100*	17.7	44.8	35.2	2.2	*100*
Northern	24.1	42.2	30.0	3.8	*100*	30.8	58.1	1.8	9.4	*100*
Western	46.7	25.9	21.5	6.0	*100*	38.3	53.2	3.5	5.0	*100*
Uganda	33.0	33.9	24.9	8.3	*100*	24.8	49.0	16.6	9.6	*100*

Source: Authors' calculations based NSDS 2004 & 2008.

Box 4: Capacity building in animal husbandry skills at farm level

South-western Region

- With regards to capacity building at farm level, farmers have undergone a wide range of trainings. These include; farm improvement, pasture management, paddocking, supplementary feeding, milk quality control, breed improvement (through AI), record keeping, leadership and co-operative development.
- Training programs are provided and supported by development partners like Land' O Lakes, Swedish Co-operative Centre, Techno Serve, Uganda Crane Creameries Cooperative Unions (UCCCU), NAADS and primary co-operatives. What is notable is that capacity building has been enabled by the existing strong farmer based co-operative structures. In addition to the development partners and co-operatives, the processor (SALL) is providing training in feeding and milk quality management to improve the capacity and quality of milk produced. Plus SALL provides farmers with inputs like drugs and aluminium cans at discount prices.

Eastern Region

- Farmers have undergone a wide range of training programs that have enhanced the capacity for milk production at farm level. These include: farm improvement, livestock health, pasture management, hay making, supplementary feeding, milk quality control, breed improvement, heat detection, mobile phone information dissemination, group dynamics and record keeping.
- Training programs are provided and supported by government agencies, co-operatives and development partners like NAADs, DDA, Land O Lakes, Eastern Dairies, Community Animal Health Network, and EADD. Farmers of Gweri Dairy Farmers' Association in Soroti district revealed that they had not under gone any form of training in the last two years attributing this to lack of funds.

Northern Region

- Dairy farmers in Northern Uganda have undergone a wide range of training programs that have enhanced the capacity for milk production at farm level. These include; farm improvement, livestock health, pasture management, hay making, supplementary feeding, milk quality control, breed improvement, heat detection, group dynamics and record keeping. However, the level of training varies between districts depending on the agent of change involved.
- Training programs are provided and supported by government agencies, co-operatives and development partners like NUSAF, NAADs, DVO's office, DDA, Heifer Project International, Land O Lakes and BRAC.

Source: EPRC (October 2011 – January 2012) Field Work

5. Technological Change

This section presents a discussion on the changes in the uptake of essential inputs in milk production across the different regions in the country.

5.1 Changes in Herd Composition and General Growth of the Dairy Sector in Uganda

With the reform of the dairy industry and an emerging formal dairy processing sector, numerous donor-funded smallholder dairy farmer support programs have been instrumental in restocking and improving livestock productivity. Such programs include NGOs such as the Heifer project and Send – A - Cow. These smallholder restocking programs have been supplemented by programs funded by development partners such as USAID and African Development Bank (ADB) through commercial banks like the former UCB (Uganda Commercial Bank).

The reforms in the dairy sector created an enabling business farming environment, by allowing milk to be traded that contributed to increase in milk production (Kjaer. *et al*, 2012). As result this supported a generic growth in the number of households undertaking dairy farming as a commercial venture in the country from 582,342 (UNHS 2005/06) to 699,074 (UNPS, 2009) (Table 8 and Table 13).

Table 8: Adoption by Households of Exotic and Indigenous Cattle between 2005 and 2009

	2005/06						2009/10					
	Exotic/Cross		Indigenous		Total		Exotic/Cross		Indigenous		Total	
	HHs	%	HHs	%	HHs	%	HHs	%	HHs	%	HHs	%
Central	26,812	15	150,980	85	177,792	100	62,820	32	133,373	68	196,193	100
Eastern	21,210	11	172,969	89	194,179	100	41,481	18	193,257	82	234,738	100
Northern	2,774	3	83,155	97	85,929	100	1,013	1	106,944	99	107,957	100
Western	68,494	40	103,342	60	171,836	100	83,212	42	117,246	58	200,458	100
Uganda	119,290	19	510,446	81	629,736	100	188,526	25	550,820	75	739,346	100

Source: Authors' calculations based on the UNPS 2005/06 and 2009/10.

With increased trade in milk, households undertook to improve herd productivity through the adoption of improved dairy cattle breeds - Exotic and crossbreds. The frequency of adoption of exotic/cross breeds between 2005 and 2009 increased in the Central, Eastern and Western region. The Western region remained the main hub for dairying activities in Uganda. The Central region provides the biggest market for the raw milk produced in the country, and the market for milk is growing in the Eastern region due to high population growth in that part of the country.

The distribution of dairy cattle by breed is presented in Table 9 and further illustrated in Figure 3. The Central and Eastern registered sizeable gains in stocking exotic breeds by 2009. This implies that growth in dairying is spreading out to other regions of the country beyond the Western region. This is a positive new development in the dairy industry.

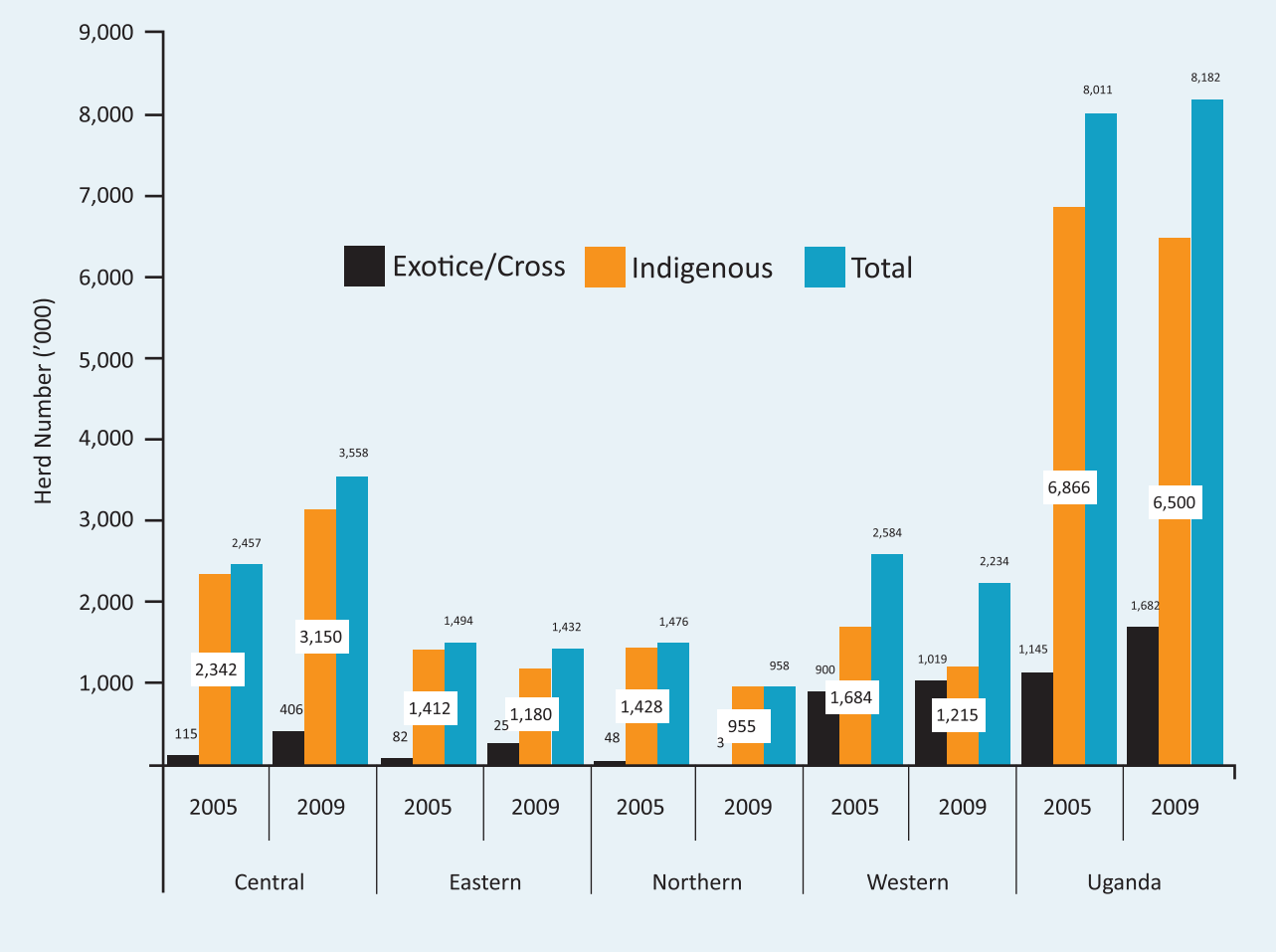
Table 9: Dairy Cattle Numbers ('000) by Breed and Region between 2005 and 2009

	2005/06						2009/10					
	Exotic/Cross		Indigenous		Total		Exotic/Cross		Indigenous		Total	
	Numbers	%	Numbers	%	Numbers	%	Numbers	%	Numbers	%	Numbers	%
Central	115	5	2,342	95	2,457	100	408	11	3,150	89	3,558	100
Eastern	82	5	1,412	95	1,494	100	252	18	1,180	82	1,432	100
Northern	48	3	1,428	97	1,476	100	3	0	955	100	958	100
Western	900	35	1,684	65	2,584	100	1,019	46	1,215	54	2,234	100
Uganda	1,145	14	6,866	86	8,011	100	1,682	21	6,500	79	8,182	100

Source: Authors' calculations based on the UNPS 2005/06 and 2009/10.

A decrease in stocking of both indigenous and improved breeds is observed in the in the Northern region (Table 9). The lack of a dairy cattle breeding program in the region explains the receding numbers of dairy cattle in the region. The EPRC research team encountered a case in Nebbi district where a group of women had received a heifer each from Send -A- Cow (NGO) but did not have access to breeding support services. The NGO did not take capacity for breeding into consideration in the distribution of seed stock. Likewise, the district veterinary staff had no breeding program in place. The other constraint to adoption of improved breeds in the Northern and parts of the Eastern region, especially in greater Soroti, as observed by the research team during fieldwork is the prevailing land tenure regime that encourages communal grazing. In such a system, there are no incentives for individuals to invest in farm infrastructure that supports the rearing of exotic/cross breeds. The few farmers that have taken up exotic/crosses dairy cattle use zero grazing which is labour intensive and limited in terms of stock numbers.

Figure 3: Distribution of Cattle number by Breed in the Dairy Industry between 2005 and 2009



There is notable transformation of livestock husbandry management practices from local to cross breeds (see picture 4). In addition dairy is undertaken as a business as observed from the effort farmers have undertaken to invest in fenced paddocks -shifting away from free range grazing (picture 5). This has reduced herd sizes and improved productivity per cow[14]. However, the system in the Eastern region ranges from zero (restricted) grazing to extensive grazing of local zebu cattle for milk production. The herding of cattle along the road side is also common in Eastern region (Picture 6).

14 A local cow yields 2-3 litres per day compared to 10-15 litres per day from cross breeds.

4 Changing herd composition from local through adoption of cross breed in Western Uganda

5 Changing pasture management from Free range grazing to paddocks in Western Uganda

Dairy Farming System in Eastern Uganda

6

Zero grazing in Mbale - Sironko, Eastern region

Cross breeds under restricted grazing in Kamuli, Eastern region

Crossbreed grazing along the road side in Kamuli, Estern Uganda

Free range grazing widely practiced in Soroti - Ngora, Eastern Region

5.2 Access and Use of Essential Inputs in Raw Milk Production

It is evident from Table 10 that more dairying households expressed remarkable improvements in access to veterinary drugs across all regions of the country between 2002and 2008[15].Access to supplementary feeds and artificial insemination (AI) services between 2004 and 2008 had remained relatively the same. But a relatively high percentage (11.4 percent) of farmers indicated that access to supplementary feeds had worsened in the Central region. This can be attributed to competition with other enterprises (poultry, and piggery) for feed residues in the more urbanized Central region.

15 The changes are ranked on a scale ranging from 1 - 'where access to inputs had improved' to 3'where access to inputs had worsened.' The rates are self-reported, and generated from a survey question soliciting qualitatively on how household's rated changes access to inputs in the last 4 years, implying 2000 (in the NSDS of 2004, and 2004 (in the NSDS of 2008, respectively.

Table 10: Households' perceptions on changes in access to Key inputs in the dairy industry

	Survey round 2004				Survey round 2008			
	Comparing 2years ago				Comparing 4 years ago			
	Improved	Same	Worsened	Total	Improved	Same	Worsened	Total
Feeds:								
Central	39.7	51.0	9.4	100	30.8	57.9	11.4	100
Eastern	24.3	67.2	8.4	100	14.3	83.0	2.7	100
Northern	7.1	81.5	11.4	100	24.2	75.8	---	100
Western	19.8	72.9	7.3	100	22.5	77.5	---	100
Uganda	24.2	66.8	9.0	100	24.5	70.2	5.3	100
Veterinary drugs:								
Central	62.5	33.3	4.2	100	75.7	20.9	3.3	100
Eastern	57.2	38.3	4.5	100	68.1	31.9	---	100
Northern	36.6	59.1	4.3	100	83.3	12.7	4.0	100
Western	47.9	47.6	4.5	100	64.6	35.4	--	100
Uganda	52.8	42.8	4.4	100	71.1	27.4	1.5	100
Artificial Insemination:								
Central	33.9	53.5	12.6	100	19.6	74.7	5.8	100
Eastern	12.8	76.0	11.2	100	26.8	66.7	6.5	100
Northern	7.6	81.1	11.3	100	12.5	87.6	---	100
Western	16.9	76.4	6.7	100	15.7	81.3	2.3	100
Uganda	17.5	71.7	10.8	100	19.0	76.4	4.6	100

Source: Authors' calculations based on NSDS 2004 and 2008.

Table 11 shows that the percentage of dairy farmers reporting to have adopted veterinary drugs and supplementary feeding improved between 2004 and 2008. However, the change is more remarkable in the use of veterinary drugs across all regions, particularly in the Central and Western regions with great potential in dairying. The relatively high response in the use of veterinary drugs could be linked to increasing adoption of cross breeds which are more susceptible to diseases. Supplementary feeding is practiced more in the urban Central region but still modestly practiced in the entire dairy sector by 2008.

The up-take of AI modestly improved from about 7 percentage points to 9 percent in the entire dairy sector between 2004 and 2008, and the adoption rate remained rather high in the Central region but declined slightly. The Central region has the advantage of being in close proximity with a rich network of AI technical staff[16];the decline could be explained by increased use of bulls as opposed to AI in breeding as alluded to by most farmers interviewed during field work.

Table 11: Incidence of adoption of key inputs by households, %

	2004			2008		
	Feeds	Veterinary drugs	AI services	Feeds	Veterinary drugs	AI services
Central	24.2	76.3	16.3	24.9	93.9	13.4
Eastern	12.9	65.3	3.5	14.0	84.2	6.3
Northern	2.5	61.0	2.3	7.0	83.2	3.9
Western	6.5	61.3	4.8	12.6	93.0	8.5
Uganda	12.2	66.2	6.6	16.8	90.5	9.3

Source: Authors' calculations based on NSDS 2004 and 2008.

16 The National Animal Genetic Resources Centre and Data Bank (NAGRC & DB) is located in the Town of Entebbe in Central Uganda.

Box 5: Adoption of essential inputs in dairying

Interviews (conducted between October 2011 and January 2012) with Key informants and Focus group discussions farmers from Western, Eastern and Northern regions of Uganda revealed that:-

- Supplementary feeding: Supplementary feeds were not adopted before liberalisation of the industry mainly due to the predominantly extensive grazing system practiced. With the liberalisation of the dairy industry and the adoption of cross breeds under controlled grazing system, farmers have taken up supplementary feeding. However, the adoption rate of supplementary feeding remains rather low and this is attributed to the high cost of supplementary feeds in relation to the prevailing low farm gate prices of milk.

- Veterinary drugs and chemicals: There is a general increase in the use of veterinary drugs and chemicals due to awareness of the need to maintain a healthy herd for high milk productivity, adoption of cross breeds that are susceptible to diseases and the ability of farmers to administer drugs themselves (a practice highly discouraged by the veterinary we interviewed). Cases where there is non-adoption of veterinary drugs are attributed to the cost of drugs and efficacy doubts.

- AI services: The adoption rate of AI remains rather low due to; the cost of the services coupled with the fact that AI off-springs from crosses are delicate and expensive to maintain. AI is associated with high mortality of parent cow at calving.

Source: EPRC (October 2011 – January 2012) Field Work

Dairy farming households that did not use the above key inputs were requested to cite reasons for not doing so. Table 12 shows that lack of basic knowledge further inhibited supplementary feeding and AI adoption between 2004 and 2008. It is cited by a relatively high percentage of non-adopters of supplementary feeding and AI across all regions by 2008. Dairy farming operations in the Eastern and Northern milk sheds were in a transition to recovery from the effects of war, and most farmers that undertook dairying activities had less experience in looking after exotic and improved cross-breeds given to them under the rehabilitation program (Table 1B and Table 2B, Appendix B). As of the Western region, the transition from extensive to semi-intensive systems introduced new animal husbandry challenges to farmers.

The cost of cattle feed continued to hinder adoption of supplementary feeding in the Central, Eastern and Western milk sheds that are relatively more populated and faced with competition for feeds with other livestock enterprises such as poultry and piggery. The question of availability had become less prominent as a reason cited for non-adoption of supplementary feeds and AI regardless of region. A sizeable proportion (Northern 31 percent; Central 25 percent; Western 14.5 percent) of cattle keepers considered supplementary feeding as not useful. This stems from the fact that open grazing fields remain the optimal option to a sizeable number of dairy farmers in Uganda. The challenges of repetitive services and frustration arising from lost time due to failures in conception are reflected in relatively high percentage of households considering AI as not being useful (Table 12). The complementary information gathered from the field highlight the problems associated with off-springs from AI being delicate and expensive to maintain, and the calves are often too big for cows to deliver (Box 5). While the increasing participation of the private sector in the veterinary inputs is a welcome initiative, the inadequate supervisory and regulatory frameworks have led to supply of counterfeit drugs on the market. This vice created a high level of doubts about the marketed drugs and consequently limits efforts to combat livestock diseases.

7 Private sector cross-breeding program for herd improvement in Western region

8 Heifer breeding on private farm in Western Uganda

Table 12: Reasons cited for non-adoption of key inputs in dairying, %

		2004						2008					
Inputs Category		Lack of Knowledge	Too Expensive	Not Available	Not useful	Others	Total	Lack of Knowledge	Too Expensive	Not Available	Not useful	Others	Total
Feeds:													
	Central	24.8	41.3	15.7	17.4	1.8	100	22.3	34.4	---	25.1	18.2	100
	Eastern	23.0	41.3	23.0	11.0	1.8	100	44.4	40.3	9.9	---	5.4	100
	Northern	31.0	16.4	42.6	9.8	0.3	100	43.7	5.0	12.9	31.4	7.0	100
	Western	33.1	25.1	30.6	7.1	4.1	100	38.3	30.6	5.8	14.5	10.8	100
	Uganda	27.2	32.6	27.1	11.2	1.9	100	34.5	32.0	5.3	16.4	11.9	100
Veterinary Drugs:													
	Central	25.1	44.2	20.2	8.6	2.0	100	3.9	14.2	---	0.5	81.4	100
	Eastern	21.9	49.8	22.6	4.4	1.3	100	12.4	21.2	---	---	66.4	100
	Northern	25.3	17.2	53.8	3.2	0.7	100	1.4	6.3	9.4	7.4	75.5	100
	Western	40.1	22.9	33.4	1.8	1.9	100	6.8	23.2	---	1.1	68.9	100
	Uganda	27.4	35.3	31.7	4.1	1.4	100	6.6	18.2	0.8	1.2	73.3	100
Artificial Insemination:													
	Central	26.4	34.5	14.6	22.9	1.7	100	41.1	22.5	4.3	21.4	10.7	100
	Eastern	26.7	36.0	24.5	11.9	0.9	100	68.7	15.4	7.4	2.3	6.3	100
	Northern	41.0	11.7	38.3	8.9	0.1	100	69.0	4.3	10.1	12.8	3.9	100
	Western	38.5	20.2	30.3	8.8	2.3	100	53.2	6.7	15.5	17.5	7.1	100
	Uganda	31.8	27.8	26.4	12.9	1.2	100	53.8	14.0	9.3	15.0	7.9	100

Source: Authors' calculations based on NSDS 2004 and 2008.

Visual evidence from field work showed that the private sector is playing an important role in AI service provision to complement breeding services from government (see picture 7 and 8). The AI program is also complimented by private sector driven cross-breeding program for herd improvement managed by companies like BRAC, African Breeders Services, and World- Wide Sires. Private dairy breeders interviewed during field work were optimistic about exploring the potential for growing an in-country dairy cattle breeding business with the expanding market for seed sock(in-calf heifers), locally and in the regional -especially in Rwanda and the Democratic Republic of Congo (DRC).

Box 6: Gaps in the structure of the dairy value chain as regards the supply of inputs

- Respondents (during field work) acknowledged that opening up of the dairy sector has to a large extent led to an increase in the use of farm inputs however, the existing low milk farm gate prices in relation to the high cost of imported inputs is hampering the adoption of better farming methods and the use of purchased farm inputs. AI technicians are still very few in number and therefore have to traverse large areas which jeopardises the detecting of cows on heat and the timely servicing of animals thereby reducing efficacy rates. This leads to high cases of repeat servicing in turn increasing the cost of AI services. As a result farmers opt to use bulls/ natural matting despite its associated problems like transmission of diseases and increased chances of passing on of inferior/undesired genes.

- Other reasons advanced for the non-adoption of AI services include management challenges of calves got through AI especially for small-scale farmers with limited resources and more so those that are just venturing into dairying, inexperience by some farmers in detecting animals on heat, high mortality rates of calving cowsdue to the mismatch between size of the parent cow and calf.

Suggested/proposed policies for improving input use by dairying farmers

- With liberalisation many players have joined the business of providing inputs to farmers. This has led to increase in quantity of inputs on the market however with varying quality standards. There is thus a need to strengthen the regulation and implementation of existing laws to uphold quality standards of inputs.

- There are market failures to provide vaccines therefore government has to assistthrough providing vaccines and sensitising farmers on the need for vaccination.

- Improved breeds require supplementary feeding to avoid nutrient deficiencies and decreased milk production especially during dry seasons. (Edmond Rugunda, October 2011). Therefore there is need to sensitise farmers regarding the usefulness of supplementary feeding especially those involved in the breeding business and the need to develop and promote the industry for supplementary feeds to avoid scarcity.

Source: EPRC (October, 2011) Field Work

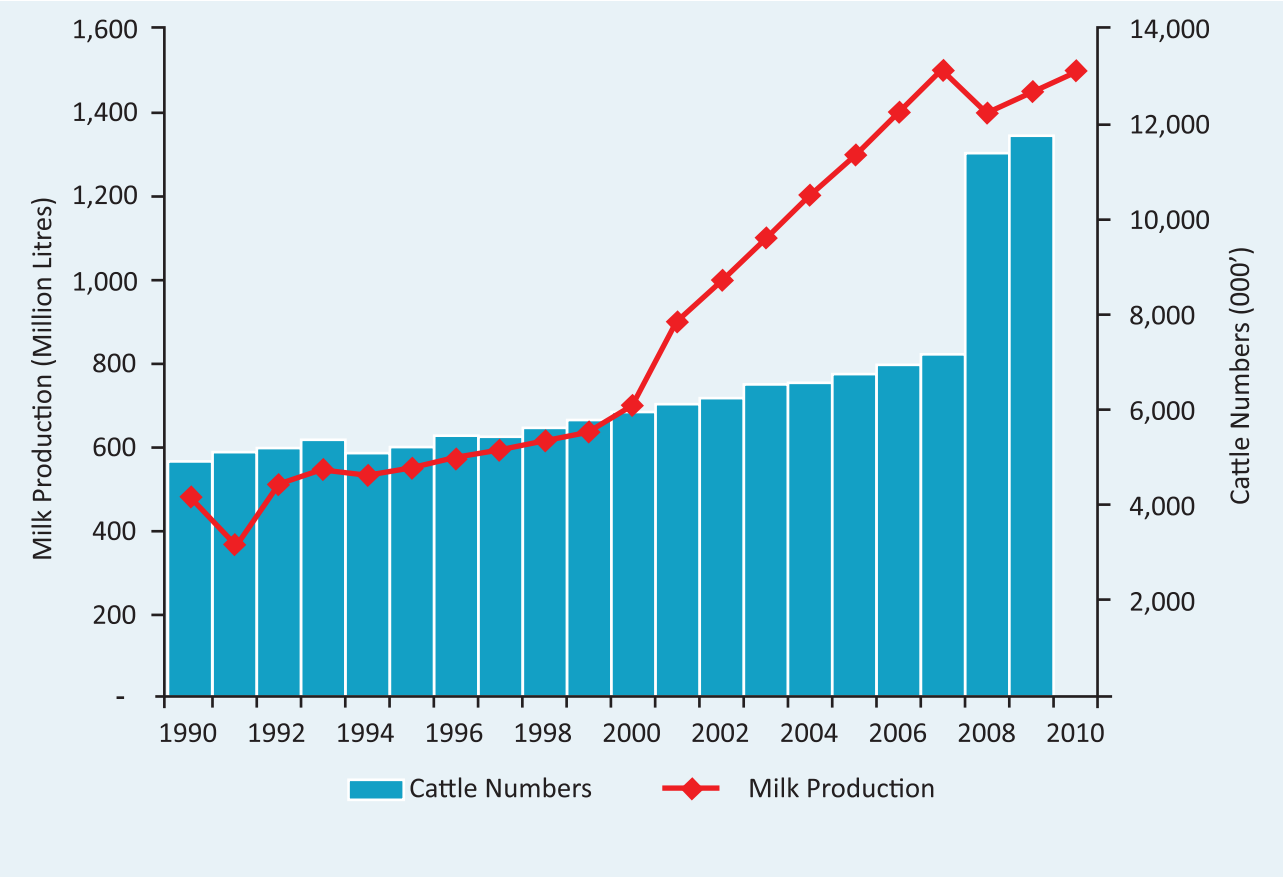
6. Raw Milk Output, Distribution, Markets and Prices

The section evaluates changes and trends in raw milk production at both national and farm level. This includes an evaluation of the variations in production capacities and technologies across regions as well as changes in the scale and technology of milk production.

6.1 Milk Production

Available statistics compiled from adminstrative and a number of other secondary sources (summarised in Figure 4) shows that overtime, raw milk production in Uganda's dairy industry has steadily grown from about 380 million litres in 1990 to 1.5 billion litres in 2010 (Figure 4). The period between 1990 and 2000 shows that growth in milk production followed a trend similar to growth in cattle population. The sudden increase in milk production between 2001 and 2010 relates to the gradual and overtime change in proportion of grade animals to local breeds. For example information in Section 5.1 (Table 9) shows that the proportion of exotic-cross breeds to local cattle increased from 14 percent in 2005 to 21 percent in 2009. Therefore, the overtime growth in cattle population from about 5 million in 1990 to 11 million heads in 2010 had both attributes - qualitative and quantitative (Figure 4). The drastic increase in cattle numbers in 2008 is attributed to inaccurate data reporting on the number of livestock in the country before the first comprehensive 2009 census of agriculture conducted by MAAIF in collaboration with UBoS.

Figure 4: Trends in Milk Production and Cattle Numbers from 1990



Source: Twinamasike (2001); DDA (2006); EPRC (2009); and UBoS/MAAIF (Statistical Abstract 1990-2010),

The different views are advanced in the literature on the relationship between milk production and growth in cattle population, and the fact that milk productivity per cow has not greatly improved with time in Ugandan dairy sector (Land O'lakes, 2003; Elepu, 2007 and World Bank, 2009). A large proportion (over 80 percent) of the total milk produced comes from the local cattle breeds[17] - the local bread account for over 83 percent of the national herd (Elepu, 2008). Yet, other studies such as Arinanye (2011) assert that annual milk production hit 1.6 billion litres in 2011 partly due to more farmers adopting milk yielding cattle. That said, increased up-take of improved breeds was observed during the field work.

The UNHS and UNPS micro data (Table 13) shows that a relatively rising number of agricultural households have been taking on dairy farming country wide – rising from14 percent in 2005 to 15.8 percent by 2010, respectively. At regional level, there is a notable increment by 3.2 percent in the proportion of households in the Northern region taking up dairy farming between 2005 and 2009, which can be associated with the dividends of the relative peace and rehabilitation programs in this part of the country. The decline in the households undertaking dairy farming amidst a rising number of agricultural households by 2010 could be linked to the pressure on land with growing urbanisation in the Central region that is procuring conditions that are leading agricultural households to resort to *'quick fix'* enterprises that require less capital, land and labour (like poultry, horticulture, piggery) that also fetch high returns in an urban market environment.

Table 13: Regional contribution to total household involved in the production of raw milk, %

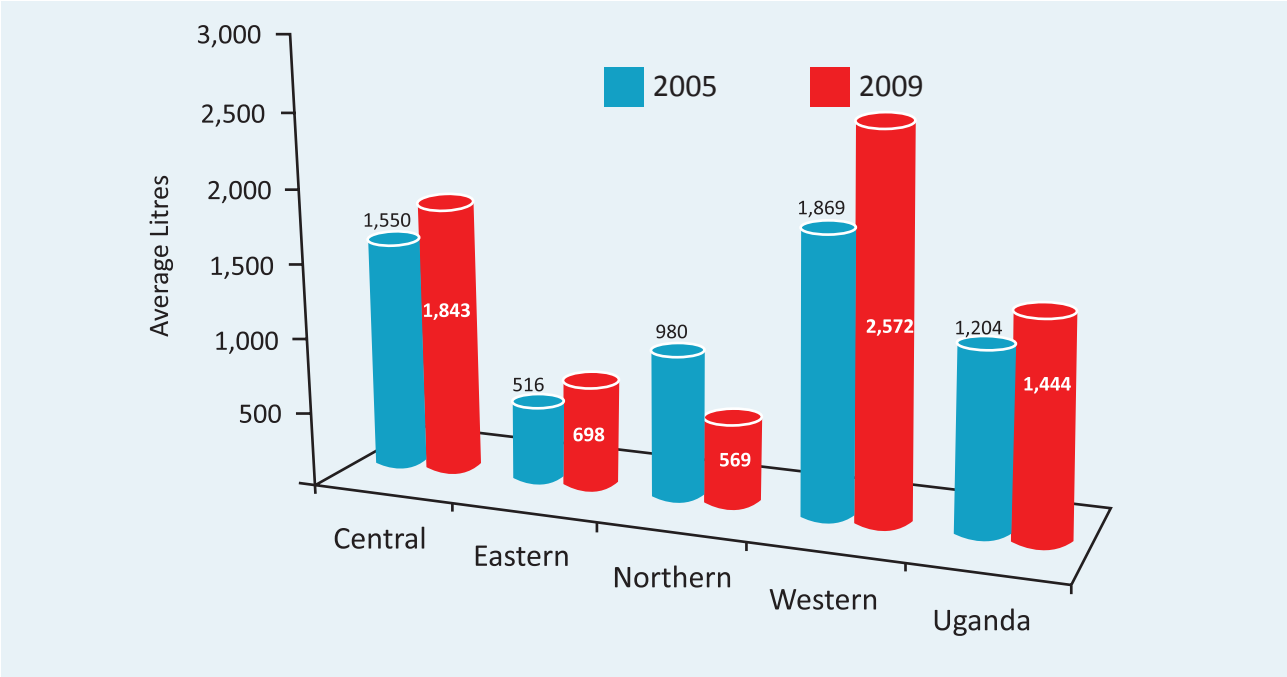
	2005/06			2009/10		
Region	**Dairying**	**Total Agricultural**	**Percentage**	**Dairying**	**Total Agricultural**	**Percentage**
	HH	HH	%	HH	HH	%
Central	157,273	1,013,951	15.5	163,680	1,148,347	14.3
Eastern	192,814	1,102,680	17.5	227,036	1,097,929	20.7
Northern	85,961	865,745	9.9	121,941	931,094	13.1
Western	146,294	1,169,123	12.5	186,417	1,247,061	14.9
Uganda	582,342	4,151,499	14.0	699,074	4,424,431	15.8

Source: Authors' calculations based on the 2005/06 UNHS, & 2009/10 UNPS

The Western region is the milk hub of the country with the most productive dairying farm units, with output per unit farm estimated at about 2,600 litres per annum in 2009/10. It is worth noting that with the exception of the Northern region, dairy farms in other regions improved in terms of average raw milk productivity per annum (Figure 5). This is can be attributed to the growing number of dairying households adopting improved breeds (refer to Table 8).

17 Milk production from local breeds averages 2 litres of milk per head per day with lactation period of 200 days – considerably below the performance of improved breeds, which can produce as much as 990 litres per head per year {World Bank, 2009}.

Figure 5: Average Annual Milk Output per Farm in Each Region



Source: Authors' computations from the 2005/06 UNHS and 2009/10 UNPS

6.2 Marketing Conditions and Prices for Raw Milk

The policy reforms and liberalization of the dairy industry were aimed at creating a competitive marketing environment. The 2004 and 2008 NSDS data provided the opportunity to evaluate individual household's self-reported[18] perception of the changes in the ability to market raw milk (see Table 14) and the price incentive structure in the raw milk market within the respective periods.

At national level, the proportion of households that report improvement in the ability to market raw milk was significantly higher in 2008 relative to 2004. This is also true by region. However, there is a regional bias. Improved ability to market raw milk was reported by relatively more farmers in the Central and Eastern regions compared to the Northern and Western region. Nine percent of farmers in the Western region expressed total dissatisfaction with the status-quo in the ability to market raw by 2008. Political instability and chronic milk shortages in the Northern region may explain the failure by farmers in this part of the country to observe any noticeable changes in their ability to market raw milk.

18 The question involved a self-reporting assessment on – "How the ability to market these items (raw milk) changed in the last 2 years coded: One for where the ability had improved; Two for where the situation had remained the same; and Three where the marketing ability had worsened.

Table 14: Household perceptions of their ability to market raw milk, %

			Between 2002 by 2004			Between 2006 and 2008				
Region	*Improved*	*Same*	*Worsened*	*Total*	*Households*	*Improved*	*Same*	*Worsened*	*Total*	*Households*
Central	43.0	51.8	5.2	*100*	*54,761*	60.0	35.7	4.3	*100*	*164,109*
Eastern	49.5	45.4	5.1	*100*	*109,157*	69.3	30.7	0.0	*100*	*105,690*
Northern	46.0	49.1	4.9	*100*	*53,274*	46.2	53.8	0.0	*100*	*38,961*
Western	36.5	45.0	18.5	*100*	*56,218*	49.2	40.6	9.2	*100*	*158,433*
Uganda	45.0	47.3	7.7	*100*	*267,844*	57.3	37.7	4.6	*100*	*467,193*

Source: Authors' calculations based on NSDS 2004 & 2008.

The assessments are reflective of the dynamics in the regional raw milk prices (marketing environment). It is evident from Figure 6 and Figure 7 that market prices (farm gate, trader and local markets) are lowest in the milk surplus Western region and highest in the milk deficit Northern region. Farmers interviewed during field work also revealed that prices severely fluctuate between the peak and lean seasons in the Western region. The relative difference in prices between regions is a demonstration that regional raw milk markets are not well integrated and structurally separated. Therefore milk producers face prices squarely determined by forces of demand and supply within regions of their operation.

Figure 6: Average trader and local market raw milk prices, Ugsh/litre

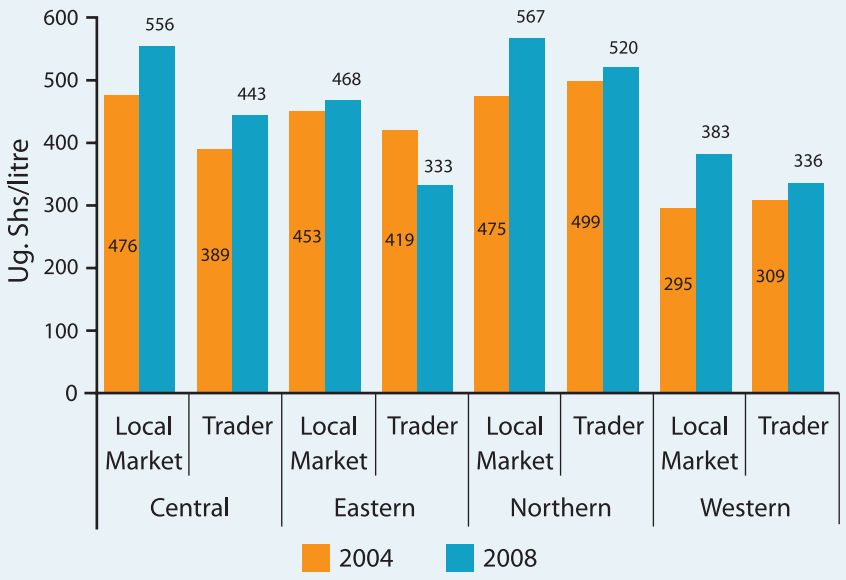


Figure 7: Average farm gate and retail prices, October 2010-February 2012 (Ugsh/litre)

Source: EPRC (October 2011-February 2012) Field Work

Box 7: Response to policy changes at farm level

South-western Region

- As a result of the liberalisation of the dairy sector, farmers interviewed noted that there is an increase in quantity and an improvement in quality of milk produced at the farm level.
- Farmer attitudes towards dairying have changed from subsistence to commercial and there is a general shift from local to cross breeds. Access to market has improved as a result of an improvement in the collection and bulking network with coolers now being located closer to farmers. This has been possible due to the proliferation of co-operatives and more players (vendors, and lager traders) joining the market.
- However, issues of low farm gate prices persist mainly in the formal marketing channel due to monopoly tendencies by SALL the biggest player in the formal marketing channel. An interview with the management of SALL, intimated that the company pays for raw milk following market demand and supply conditions. The excessive marketing behaviour in the dairy sector is documented by the MoFPED (2012), where farmers report that - "sometimes SALL cuts prices without informing us. We get to know this at the time of payment yet when we were supplying we knew it was the usual known price".

Eastern Region

- As a result of the liberalisation of the dairy sector, farmers interviewed noted that there is an increase in quantity and an improvement in quality of milk produced at the farm level. However, milk production in the area/region is still very low.
- Farmer attitudes towards dairying have changed from subsistence to commercial and there is a general shift from local to cross breeds.
- Access to market has improved as a result of an increase in demand for milk due to increased awareness of the nutrition value of milk.
- Collection and marketing have had minimal changes due to the low milk production. Milk prices have generally improved since liberalisation although still low compared to increases in prices for farm inputs. Unlike South-western Uganda the Eastern region does not experience severe milk price fluctuations between seasons.

Northern Region

- Farmers interviewed noted that there is an increase in quantity and an improvement in quality of milk produced at the farm level as a result of liberalisation. However, milk production in the area/region is still very low partly due to impact the LRA war had on dairy farming.
- Farmer attitudes towards dairying have changed from subsistence to commercial and there is a general shift from local to cross breeds.
- Access to market has improved as a result of an increased in demand for milk.
- Collection and marketing have had minimal changes due to the low milk production.
- Milk prices have generally improved since liberalisation although still low compared to increases in prices for farm inputs.

Source: EPRC (October 2011 and February 2012) Field Work

7. Milk Storage and Transportation

There is a general increase in milk output and hence marketable surpluses in the post-reform period across all regions in the country. Analysis of 2005/6 UNHS reveals that about 42 percent of the raw milk produced is sold to either processors or direct consumers (Table 15). Milk sales increased to 52 percent of production by 2009/10, with the bulk of traded milk coming from the Western milk shed. In comparison, a study by the World Bank (2009) reveals that of total milk production per year, 40 percent is consumed on the farm and 40 percent is marketed through informal market channels[19]. The remaining 20 percent enters the formal market. Notably, the same study pointed out that 80 percent of raw milk was still traded outside the purview of DDA. Although is not surprising since the DDA activities are concentrated mainly in the Central and Western milk sheds and remain limited in the other two regions (EPRC fieldwork).

Table 15: Regional Distribution of Milk Surpluses

Regions	2005/06			2009/10		
	Output	Sales	Home Use	Output	Sales	Home Use
	Million Litres		(%)	Million Litres		(%)
Central	244	85	65	302	139	54
Eastern	100	41	59	159	62	61
Northern	84	17	80	69	32	54
Western	273	152	44	480	292	39
Uganda	701	295	58	1,009	524	48

Source: Authors' calculations based on UNPS 2005/6 and 2009/10

19 The informal markets are markets near to producer locations where producers directly or through traders collecting milk from farmers' homesteads sell milk to consumers or middlemen suppliers of kiosks and small retail shops. It is estimated that approximately 90% of marked milk is channeled through the largely and vibrant informal market (Keyser, 2009). The formal market for milk (although known to be concentrated in the Entebbe-Kampala-Jinja conurbation), is showing a healthy rate of growth.

Box 8: Milk marketing channels and institutions in dairy industry

South-western Region

- In South-western milk shed, milk from the farms is channelled through both formal and informal channels.
- The formal marketing channel is organized in that; from farms milk is sent to collecting centres operated by primary co-operatives. From *primary* collecting centres milk is transported to larger bulking centres at the district level (operated by district co-operative unions). From the district co-operative unions, milk is chilled and transported to the processing plants.
- The formal network, farmers are organised into co-operatives based on networks that were formed around the distribution networks of former DC that became SALL after liberalisation. This channel largely feeds SALL that currently controls about 78 percent of the formal milk marketing channel.
- Some of the milk is drawn into the largely informal collection channels at the different nodes of the bulking stage. Some milk at primary co-operatives is sold to traders and vendors and some co-operatives have outlets that sell directly to individual consumers in urban areas. This largely happens during peak seasons when there is excess milk.

Some farmers have opted not to join the co-operatives and therefore sell their milk through the informal market channels. It was observed during the field work that farmers closer to peri-urban centres (market) are reluctant to join co-operatives and market a substantive volume of their milk through the informal market channel. This is because proximity to market guarantees better prices with money earned immediately.

- It was revealed (from the FGD and in interviews with key informants in the industry) that the market for milk is readily accessible. However, farm gate prices are rather low. Farmers are free to sell milk to any buyer/ agent of their choice irrespective of being members of co-operatives. Co-operatives are the main buyers of milk from their members (between 80 and 90 percent) and sell it to SALL. Other buyers in the formal market channel include GBK and Birunga, and an estimated 2 percent of the milk goes through the informal marketing channels.
- Processors exercise price differentiation depending on the volume and quality of raw milk purchased during peak and lean seasons. For example, GBK[3] offers Shs. 450 and Shs. 750 per litre during the peak and lean season respectively. While Paramount[4] dairy processes a smaller volume and specialises in the production of niche products (cheese and fresh creams) produced from high quality milk offers premium price – ranging between UShs. 550 and UShs. 900 per litre.

Northern Region

- Milk from the farms in Northern Uganda is generally sold unprocessed due to lack of processing plants in the region. Milk from farms is collected from door to door by collecting agents, traders or vendors or marketed by farmers themselves. Only some yoghurt is processed by the Gulu Women Dairy cooperative society.
- Respondents revealed that the market for milk was readily available this being in a milk deficit region. Marketing of milk from farm level is channelled through both “semi-formal” and informal arrangements. Some farmers are organised in co-operative unions/associations and sell their milk through the guidelines of the co-operatives while others sell their milk directly to consumers and milk traders.

Eastern Region

- Milk from the farms to processing plants is channelled through farmer groups, individual farmers and vendors. Milk from farms is collected from door to door by collecting agents, traders or vendors and transported to the processing plants.
- Respondents revealed that the market for milk was readily available this being in a milk deficit region. Marketing of milk from farm level is channelled through both “semi-formal” and informal arrangements. Some farmers are organised in co-operative unions/associations and sell their milk through the guidelines of the co-operatives while others have opted remain out of co-operatives.

- Processors in the Eastern region offered the same price during both peak and lean seasons. However, they practice price discrimination based on supplier category. Soroti Dairy limited for example offers UShs 500 per litre to farmer groups and UShs 600 to individuals and vendors while Eastern Dairies offers Ush 600 to farmers and UShs. 800 to vendors or collecting agents.

- Formation of dairy farmers' co-operatives in Kamuli for example was mainly influenced by the NAADs program where services could only be accessed by groups. Some farmers opted not to join the co-operatives and therefore sell their milk independently. Unlike in South-western Uganda where milk channelled through co-operatives largely ends up being sold to processors (formal milk marketing channels), in the Eastern region, milk collected through co-operative arrangements largely ends up being sold to consumers through traders, cooperative outlets and retailers in raw unprocessed loose form.

- There were no direct involvement of co-operatives in collecting and transporting milk from farmers. Milk is collected by collectors/traders or cooperative agents who then sell it directly either to consumers, co-operative outlets or to milk retailers. This type of milk collecting arrangement greatly exposes farmers to dubious middle men and frequent incidences loss of income and expensive farmers' milk collecting equipment (aluminium cans).

- Farmers are free to sell milk to any buyer/agent of their choice irrespective of being members of a union/ association.

Source: EPRC (October 2011 – February 2012) Field Work

9

Well equipped Milk Collection (Bulking & Transportation) for processing in the formal marketing channel in South Western Uganda

10 Milk Handling in the formal Marketing Channel in Western Region

11 Milk Collection in the Eastern Region is predominantly Informal and ill equipped

12

Dairy Corporation Network taken over by SALL in South-western Uganda

12

Dairy Corporation Network abandoned in Eastern Region

14 Some of the Former Dairy Corporation milk collection centres taken over by private individuals in Eastern Region

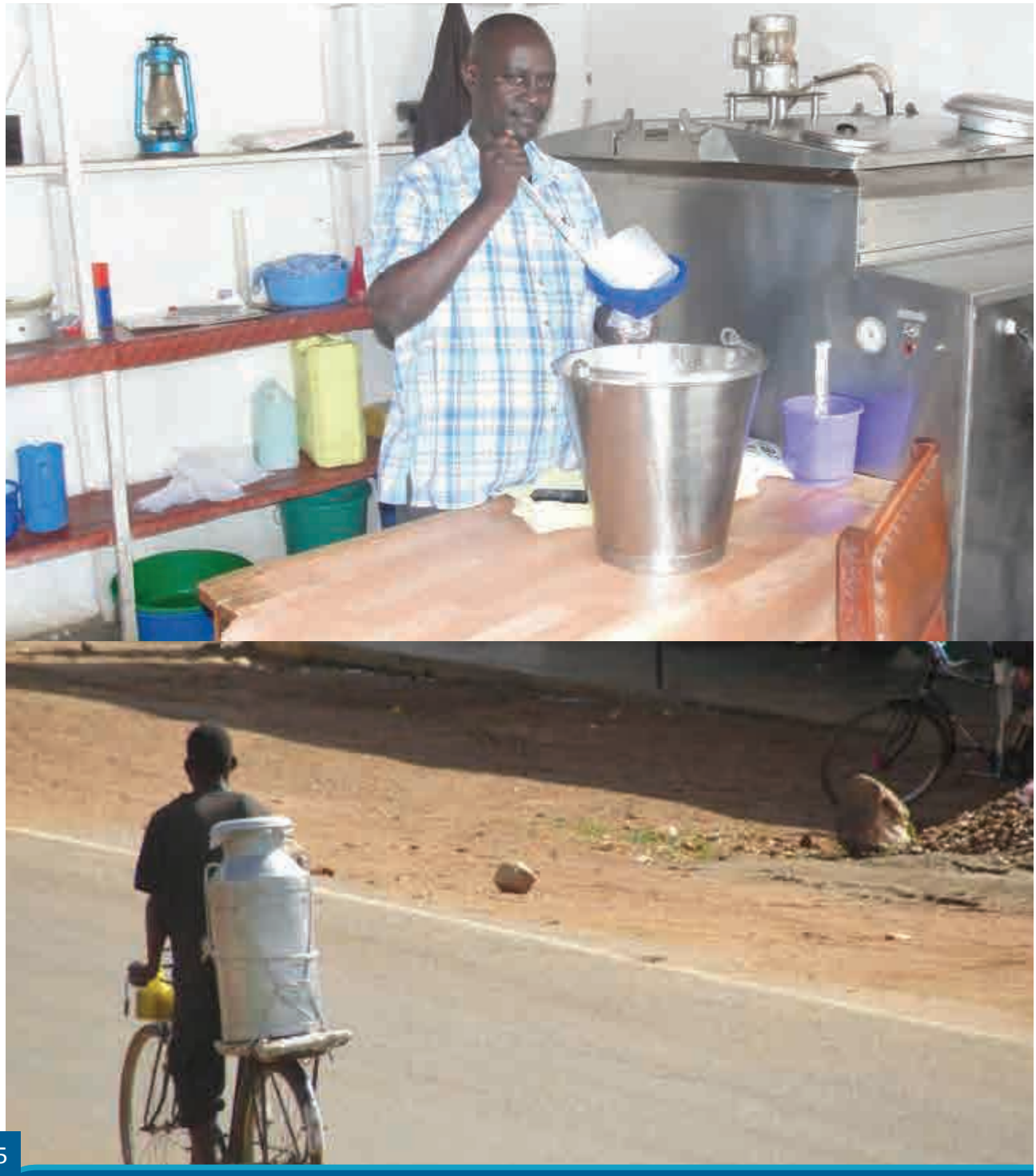
The private sector has been assuming an increasing role in the collection, transportation, processing and marketing of milk and milk products[20]. Numerous private sector operators have set up dairy related enterprises all over the country with several bulking and milk-processing facilities especially in the south-western milk-shed. However, the capacity for milk bulking and transportation has not been equally developed in all the milk sheds countrywide. Pictures 9 to 14 provide visual differences in milk handling facilities across regions as captured during field work by the EPRC research team.

According to the World Bank (2009), there were between 90 and 100 milk collection centres spread throughout South-western, Central, and Eastern regions – with 70 owned by SALL. Each centre comprised of 2,000 to 5,000 litres capacity milk cooler and a generator. However, World Bank (2009) also reveals that there were 100,000 itinerant traders using metal milk cans instead of plastic. There were also less than 50 milk traders countrywide and about 60 insulated milk tankers with total capacity of over 400,000 litres.

This milk distribution network was supported by a large number of mobile hawkers (on foot, bikes, using buses and vehicles) especially within 20 Km radius of major towns (World Bank, 2009). These largely informal traders are involved in the delivery of raw milk to bulking centres, kiosks, and households. At the tail end of the milk value chain, hundreds of milk kiosks and shops sell fresh or hot milk and processed products to consumers. It is important to note that the liberalization of

20 Before the liberalization the dairy sector, milk collection and transportation had been under DC government control. DC was inefficient and consequently milk marketing did not meet the farmers' expectations. The farm gate prices offered by DC were very low, something that acted as a disincentive to the industry's growth (EPRC 2009). Following the liberalization of the dairy sector in 1993, and complete privatization and the transfer of DC to SALL, the network of collection centers expanded. This ultimately reduced the informal and thereby expanded the formal sector milk collection network.

the dairy industry opened wide opportunities for many ill-equipped private informal milk traders to participate in the value chain. This rampant informal market run by itinerant raw and loose milk traders has been growing and out-competing the formal milk marketers, and has proved difficult for the DDA to regulate. This amounts to unfair competition due to regulatory obligations imposed on formal traders that informal traders evade. The phenomenon remains the main constraint to developing and expanding the formal milk marketing channel. The advantage that informality confers can be seen through the employment opportunities that have been created in milk transportation, retailing, and at bulking centres across all regions of the country.



15

Milk Retailing & Vending via the Informal Channel

8. Milk Processing and Capacity Utilization

The liberalization of the dairy industry in the mid-90s broke the monopoly of DC and opened up opportunities for private investment. The dairy sector is one of the sectors where the concept of value addition has been successfully achieved. The processing of milk and production of dairy products previously imported is one of the successes recorded by the dairy industry (see picture 16 of locally processed dairy products in Uganda). Before the industry was deregulated, informal milk trading[21] formed the biggest network for surplus milk in most rural Uganda. The formal sector handled only 10 percent of marketed milk (MAAIF, 1993). The development of the informal sector began in the earnest period of civil disturbances between 1977 and 1986, when DC was unable to service its suppliers, and had suffered from widespread looting (Keyser, 2009). The informal market comprises both direct sales by producers to consumers in the neighbourhood of their farms and sales to traders, vendors and associations that transport milk to local urban markets. The associations are estimated to account for 60 percent of farm sales, though this proportion varies significantly across regions in the country (ILRI, 1996; EPRC, 2009).

16

Dairy products from Mini-dairies in Eastern Region

21 The development of the informal sector began in the earnest period of civil disturbances between 1977 and 1986, when DC was unable to service its supplies and it suffered from widespread looting (Keyser, 2009).

The level of private sector investment after the liberalization of the dairy industry is the subject of this section. Focus is placed on the number of new dairy plants and mini dairies that have been established, as well as the expansion in value addition i.e. through the introduction of new milk products (UHT, powdered milk, yoghurt, cheese etc.) on the market. Growth in milk processing signifies strides made to expand the formal milk sector. This has improved the quality of milk, and created capacity for milk exports to the regional market.

8.1 Private Sector Investment in the Dairy Industry

With policy and institutional changes in the milk sub sector that began in early 1990s, a number of private enterprises, cooperatives, and associations began processing and marketing raw milk and other dairy products, competing directly with DC. In 2001, seven dairy companies were pasteurizing, packing, selling milk and other dairy products mainly in urban areas in Central and South-western areas of the country (World Bank, 2009). Between 2008 and 2009, the number of companies grew from 12 to 14 private milk processing enterprises (Table 16). It is worth mentioning that with the exception of White Nile Uganda Limited (see picture 17) that is located in the Eastern region (Jinja Town), eleven out of the fourteen processing plants are located in Central and Western Milk sheds (Table 15).

Most processing plants are located in the Central and Southwest milk sheds and are operating at 46 percent capacity of the combined installed capacity output of 686,200 litres per day. More important to note is that SALL's market share of the processing capacity stood at 80 percent in 2009, despite the increasing participation of other private players in the market (see Table 16). The benefits of the privatization process of the dairy industry have not yet spread out equitably at the processing and marketing stages of the dairy industry commodity value chain. Milk processing in the Eastern and Northern region is undertaken on small scale mini-dairies (see picture 16). The mini-dairies are managed and organised by private individuals and primary cooperative societies. The success story here is that value addition focussing on products like cheese, yoghurts for the local markets that are scale neutral is produced by mini-dairies (as listed in Box 9) in milk deficit Northern and Eastern regions.

17 New Dairy Processing Plant in Eastern Uganda (White Nile Dairies)

Table 16: Milk Processing Plants and Mini-Dairies in Uganda, June 2009

				2004		2009				
No.	Company	location		Capacity	Capacity utilized	Installed capacity	Capacity utilized Litres/day	(%)	Market Share (%)	Products
1.	Sameer Agriculture & Livestock Ltd	Central	Kampala	130,000	----------	500,000	250,000	50	79.8	Pastured milk, UHT, yogurt, ice cream, butter, ghee
2.	JESA Farm Dairy	"	Busunju	20,000	----------	30,000	24,000	80	7.7	Pastured milk, yogurt, ice cream, butter
3.	Gouda Gold	"	Kampala	5,000	----------	15,000	1,500	10	0.5	Cheese
4.	MADDO Dairies Ltd	"	Masaka	2,000	----------	2,000	800	40	0.3	Pastured milk, yogurt
5.	NIRIMA Dairy & Foods Ltd	"	Entebbe	----------	----------	8,000	2,000	25	0.6	Pastured milk, yogurt, ice cream
6.	Napier Dairy	"	Ntinda	----------	----------	10,000	2,000	20	0.6	Yogurt, ice cream
7.	White Nile Dairy	Eastern	Jinja	10,000	----------	6,000	3,000	50	1.0	Pastured milk, yogurt, ghee, cream
8.	Kaisa Fresh Milk	"	Kamuli	*10,000*	----------	----------	----------			
9.	Teso Fresh Dairies	Northern	Soroti	3,000	----------	3,200	800	25	3.8	Pastured milk
10.	GBK Dairy Products (U) Ltd	Western	Mbarara	*90,000*	----------	*54,000*	*15,000*	28	4.8	Pastured milk, UHT milk, ghee, yogurt
11.	DairiBoard (U) Ltd	"	Mbarara	----------	----------	40,000		-	-	Plant yet to be operational
12.	Birunga Dairy	"	Kisoro	8,000	----------	15,000	12,000			UHT milk
13.	Paramount Dairies Ltd	"	Mbarara	3,000	----------	3,000	2,000	67	0.6	Cheese
14.	Alpha Dairies	"	Mbarara	*50,000*	----------	----------	----------			
	Total					686,200	313,100	46		

Source: DDA (2004) & BoU and PMA (2009) Agricultural Finance Yearbook

Box 9: Background information on processors interviewed (October 2011)

Region	Processing Plant	Year	Location	Employees	Installed Capacity	Utilized Capacity	Products
Central:							
Eastern:	White Nile		Jinja	-	6,000	3,000	Pasteurized milk, yoghurt
	Dutch Farm	1998	Mbale	8	450	250	Cheese, Yoghurt, Unprocessed Loose Milk
	Eastern Dairies	2010	Mbale	5		50-100	Yoghurt, Unprocessed Loose Milk
	Soroti Dairy	2003	Soroti	16		1,200 – 2,000	Yoghurt, Sour Milk; Unprocessed Loose Milk; Butter & Ice-cream[5]
Northern:	Gulu Women Dairies	2008	Gulu	9	300	80	Yoghurt
Western:	G.B. K Dairy	1996	Mbarara	75	96,000	45,000-60,000	UHT milk; yoghurt & Butter
	Paramount Dairies	1992	Mbarara	24	1,200	1,200	Cheese, Fresh Cream
	Shumuk/Alpha	2011	Mbarara	-			

Source: EPRC (October, 2011) Field Work

Box 10: Processor responses to a changed business and policy environment

South Western Region

- As a result of the reform of the dairy sector, processors interviewed noted that there is a general increase in the quantity of milk processed. For example, GBK has increased the volume of milk processed from 5,000 litres to 60,000 litres per day between 1996 and 2011.
- The increase in the quantity of milk processed is also partly driven by an improvement/increase in the consumption of processed milk products resulting from a growing middle class.
- There are observed changes in packaging technology from plastic porches to tetra-packs due to increased competition among many processors (players) in the market.
- There is a general increase in farm gate milk prices due to an increase in the demand for milk resulting from many players joining the industry. The quality of raw milk produced by dairy farmers, and milk handling (hygiene) practices have improved.
- There has also been a shift from individual to group marketing.
- The processors interviewed in South-western Uganda revealed that there is noticeable improvements when it comes to milk collection and transportation; due to improvements in the milk collection network and infrastructure, the number of coolers and cooling plants have increased, milk is no longer transported in plastic jelly cans but aluminium cans as per the DDA regulations.

Eastern Region

- The processors interviewed in eastern Uganda also revealed that there are noticeable improvements when it comes to milk collection and transportation although the region still lags behind South-western Uganda.
- The system is predominantly door to door collection of milk by traders and some farmers organised in groups have milk collection centres.
- There is a gradual shift from transporting milk using plastic jerry cans to aluminium cans (DDA regulations). There is a gradual shift from using bicycle for transporting milk to motor-cycles (Boda-Bodas) and pick-up trucks, this has ensured timely delivery milk and has reduce wastages. But the total absence of refrigerated trucks was apparent in the Eastern Region.
- The increase in farm level milk production is partly attributed to increased market for milk, trainings from NGOs and government agencies, reduction in cattle rustling and increased regional market for animal, and animal products especially in South-Sudan.

Northern Region

- There is minimum processing of milk done in Northern Uganda. The one processor interviewed revealed that there is an increase in farm level milk production, partly attributed to increased market for milk, trainings from NGOs and government agencies, restocking programs following the end of LRA war and increased regional market for animal, and animal products especially in South-Sudan.

Source: EPRC (October, 2011 and February 2012) Field Work

8.2 Growth in Milk Processing

Processing of raw milk and production of dairy products has followed a trend similar to that of raw milk production (Elepu, 2008 and World Bank, 2009). Pasteurized milk accounts for over 60 percent of total volume of processed product, with the balance made up of yogurt, ice cream, sour butter, ghee, and cheese (Table 17). Many micro-scale processors handle insignificant volumes of milk used in the production of local dairy products like cultured milk, ghee for the local market (World Bank, 2009). The production of processed fluid milk has been unstable over the reform period with recent production figures less than the 1998 pick amount of 32 million litres reported in the 1999 UBoS (Statistical Abstracts).

Table 17: Trends in Milk Processing

Product	2003	2004	2005	2006	% change 2005-06
Pasteurised Milk(litres)	17,317,558	20,093,094	21,033,567	22,024,012	4.7
UHT Milk (litres)	5,748,041	3,769,397	5,985,008	8,826,112	47.5
Yoghurt (lítres)	425,464	618,751	689,777	743,000	7.7
Ice cream (litres)	246,482	686,933	688,567	690,102	0.2
Ghee (Kg)	12,215	38,050	70,543	110,601	56.8
Cheese (Kg)	30,114	82,844	85,679	89,844	4.9
Cream (litres)	7,961	10,433	55,879	74,797	33.9

Sources: Mugerwa (in EPRC, 2009)

Generally, the dairy industry has been particularly successful in recent years, being able to supply the local market (raw milk) for much of the year, with the exception of the generally dry months of March and August (World Bank, 2009). Milk production has consistently exceeded consumption (especially during rainy periods), and has encouraged the development of small milk processing plants (for butter, yogurt, cheese, and ice cream, in particular).

Table 18: Processing Capacity Utilization (million litres) in EAC and COMESA Region

Country	Installed Capacity	Utilized Capacity	Excess Capacity	Capacity Utilization (%)
Kenya	2,000	0,500	1,500	25
Uganda	0,330	0,120	0,210	36
Tanzania	0,510	0,150	0,360	29
Ethiopia	0,130	0,020	0,110	15
Malawi	0,126	0,035	0,091	28
Zambia	0,347	0,113	0,234	33
Mauritius	0,050	0,049	0,001	98
Rwanda	0,023	0,013	0,010	57
Total	3,516	1,000	2,636	

Source: RATES, ASERECA/ECAPAPA Country Report (2004)

Dairy processing in the East African Community (EAC) region is fairly developed. The total installed milk processing capacity in the EAC by 2004 was 2.9 million litres per day. Out of this, only 0.78 million litres per day are utilized, with the rest remaining idle. A closer look at processing capacities of individual EAC countries shows that Kenya accounts for over one-half of the total installed capacity in the region followed by Tanzania, Uganda, and Rwanda (Table 18).

Box 11: The underutilised processing capacity paradox

The problem of underutilized processing capacity is still a paradox among the actors along the milk value chain:

- Dairy farmers do not understand why processors operate below installed capacity yet they are frequently faced with un-purchased volumes of surplus[6] milk during peak seasons especially in the South Western Milk Shed;
- SALL the major player in the formal value chain imposes quotas during the peak season when there is surplus milk and this is accompanied by a drop in raw milk purchase prices ;
- The processors link the underutilized processing capacity phenomenon to the limited market for pasteurized milk due to stiff competition from the informal[7] sector that deal in relatively cheap loose unprocessed milk;
- In Uganda about 80% of marketed milk is sold as loose unprocessed milk at relatively lower prices[8]thereby out-competing processed pasteurised milk in the market.
- Processors recognise that the informal market is strong and vibrant, (John Anglin, October 2011). Pasteurised milk (the main processed milk product on the market) has a limited shelf life therefore processors set their production targets depending on what the market can absorb.
- Another facet of the paradox is that whereas the industry is struggling with the problem of underutilised processing capacity, more processing plants are being set up. For example, two more plants (UCCCU and Pearl) are currently being set up in South-western Uganda.

Proposal to remedy situation:

- Possible solutions to solving this paradox include; expansion of capacity to produce and market processed dairy products with a long-shelf life (like UHT) for both the domestic and export market;

- Gradually reducing the share of loose milk marketed unprocessed. This implies that the sector must build capacity to produce dairy products that meet international standards.

- The prevailing raw milk marketing environment (system) does not provide incentives to farmers for producing better quality milk - in this largely *"low input- low cost milk industry"*. Any effort to improve the quality of milk offsets the margin. The value of milk should be measured in kilograms instead of litres to compensate for the fat content in the milk as a yard-sick for the quality of milk. Therefore better quality milk should be bought at a premium price" (John Anglin, October 2011).

- Reducing the size of the informal sector will require mechanisms that ensure reasonable and stable farm gate prices to sustain milk production, and consumer prices that ensure affordable consumption of quality milk across households of various income brackets.

Source: EPRC (October, 2011) Field Work

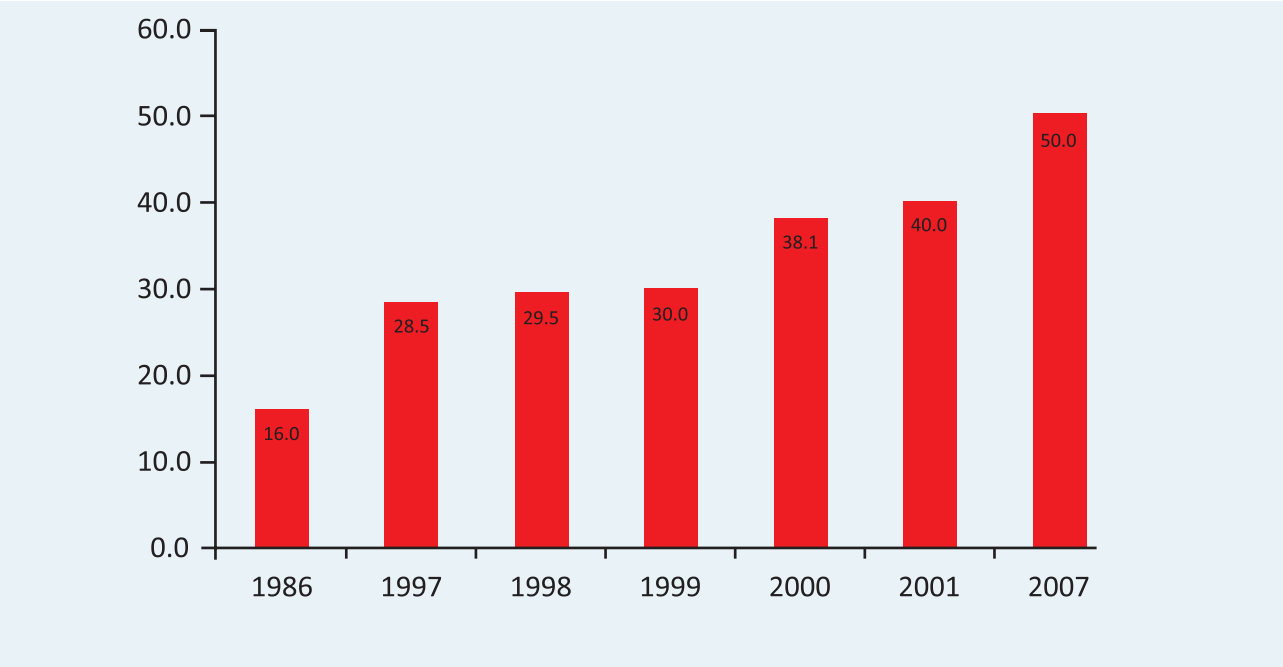
9. Milk Products Consumption and Net Exports

This section provides insights on the progressive changes in the level of consumption of dairy products in Uganda. The level of regional and international trade in dairy products between Uganda and the rest of the world is also covered in this section.

9.1 Milk Products Consumption

With the advent of the dairy sector reform, the national domestic consumption of milk has been growing with time (Figure 8). The UNPS data provided insights into milk consumption at household level. However, such survey data did not capture information on other milk products. The results are presented in Table 19. The per capita milk consumption, on average, stood at 58 litres per annum well below that of neighbouring Kenya of 72 litres and the internationally (FAO/WHO) recommended 200 litres (cited in World Bank, 2009). While the World Bank (2009) indicates that Uganda has attained a level of near national self-sufficiency in milk production, it is apparent that attaining the 200 litres per capita per person mark recommended by the World health Organization (WHO) requires 6 billion litres per annum to be produced in the country (assuming a population of 30 million Ugandans). Currently annual milk production in Uganda is estimated to be 1.6 billion litres.

Figure 8: Per capita annual consumption of fluid milk, 1997-2007 (litre/p.a)



Source: Wozemba and Nsanja (2008)

Significant regional differences in per capita milk consumption within the country are notable, ranging from 86 litres per annum in Western region to 43 litres in Eastern region in 2009/10 (Table 19). Per capita milk consumption remained rather static at 58 litres per capita at national level – and below this national average figure in the Eastern (43 litres), Northern (48 litres) and Central (53 litres), with no improvements recorded in the Central region between 2005 and 2009. Milk consumption figures are low and constant in the Eastern region are possibly due to increasing pressure on due to the high population growth that negatively impact on investment in the stocking of dairy cows at household level. While having expansive dairy activities and the tradition of milk consumptions may explain the high per capita milk consumption in Western Uganda. The decline in milk consumption recorded in

the Northern region over the four year period could be linked to the decline in the stocking of dairy cattle in this part of the country as observed in Section 5.1, Table 9.

Table 19: Regional Distribution of Milk Consumption per Capita (litres) 2005-2011

Region	2005/06		2009/10	
	Per capita	per Annum	Per capita	per Annum
Central	53	5,238,422	53	4,479,379
Eastern	43	2,393,511	43	2,927,288
Northern	62	916,835	48	974,041
Western	67	3,892,705	86	4,375,582
Uganda	58	12,441,473	58	12,756,290

Source: Authors' calculations based on UNPS 2005/6 and 2009/10.

Some studies such as Elepu (2006) attributed the low level of milk consumption in Uganda to poverty–low disposable income – and the poor cultural value of milk consumption in Uganda. A number of initiatives are being implemented to increase consumption of milk and dairy products and build a strong local market. The DDA is liaising with the Ministry of Health (MoH), and Ministry of Education and Sports (MoES) to promote milk consumption in schools. Similar initiatives are being supported by the private sector, particularly NGOs such as Land O' Lakes (DDA, 2008).

9.2 Exports and Imports of Dairy Products

Most of the milk (98 percent) marketed is sold to the domestic market while only 2 percent is exported to regional markets such as Kenya, Rwanda, Tanzania, and Democratic Republic of Congo (DDA, 2009). Exports of UHT per annum to neighbouring countries, averaged 0.55 million litres between 2000 and 2007. This amounted to less than 2 percent of total processed milk, and less than 1 percent of total UHT manufacturing capacity (World Bank, 2009). The World Bank (2009) further shows that exports of UHT milk from both SALL[22] and GBK Dairy products (U) Ltd) and milk powder combined had increased significantly in the recent past from less than 0.20 million litres in 2006 to more than 1.40 million litres in 2007. In addition, there is a significant (not quantified) informal cross border trade in unprocessed (raw) milk. The principal markets are Rwanda (where 2.6 million litres were imported from Uganda in 1995). In Kenya milk deficits appear likely to continue for some time. DRC, Sudan, and Tanzania also feature in export statistics according to the World Bank (2009), further implying that a huge opportunity exists for Uganda to expand dairy exports. Uganda needs to take advantage in the short-run by investment in technology to increase milk production and processing.

Data on imports of dairy products into Uganda (Table 20) in the post[23] subsector reform era (2001-2009) indicate that the value of dairy products imported into Uganda are still sizeable and have been increasing.

22 The bulk of powdered milk is produced by SALL, which took over the assets of DC and boosted its processing capacity by installing a 200,000 litre powdered milk plant in Kampala in 2008, and began to export the product.

23 In absence of a complete set (of historic secondary) data on imports and exports of dairy products in Uganda in the pre dairy sector reform (Table).

Table 20: Value of imports of dairy products, 1995-2009 (US$)

Year	Buttermilk	Milk Cream Concentrated	Milk Cream > 6% fat	Total
1995	975	3,103,039	83,837	3,187,851
1996	4,129	2,142,128	7,315	2,153,572
1997	624,502	107,731,496	8,478,013	116,834,011
1998	25,737	2,908,507	41,736	2,975,980
1999	14,965	1,189,525	36,679	1,241,169
2000	26,857	1,215,698	61,100	1,303,656
2001	17,303	1,014,043	49,204	1,080,550
2002	190,928	1,624,256	165,883	1,981,067
2003	65,322	2,164,340	124,141	2,353,803
2004	163,505	1,688,251	64,472	1,916,228
2005	159,759	1,735,210	38,151	1,933,120
2006	183,751	2,624,774	69,919	2,878,445
2007	277,128	4,111,080	640,632	5,028,840
2008	288,016	3,935,234	772,528	4,995,777
2009	177,978	2,101,208	881,536	3,160,722

Source: UBoS (several issues)

10. Challenges and Constraints in the Dairy Sector

This section expounds on shortfalls along the milk value chain that were never adequately addressed by the reforms. The challenges are of varying degrees across regions, therefore components of the milk value chain where the private sector driven reforms have not worked well in directing the required resources are highlighted.

10.1 Low uptake of improved production technologies

The slow uptake of technology remains one of the documented constraints in the Uganda dairy sector (World Bank, 2008). This is linked to low level farm investment in improved dairy cattle breeds and appropriate husbandry practices. The farming system that characterizes the dairy industry in Uganda (Box 12) remains basically low input low output, given the low usage of improved inputs such as improved breeds, supplementary livestock feeds (dairy meal, maize bran, mineral lick, and nutrimix), milking machines and AI technologies. Less than 10 percent of dairy farmers country-wide use AI services. Investment in Research and Development (R&D) in dairy sector requires heavy public sector investment to promote the up-take of technologies that remain expensive for the resource-poor small holder farmers. Based on information gathered during the fieldwork, it was revealed that most dairy farmers that took an improved heifer to start up zero grazing units in the Eastern and Northern regions depended by and large on external interventions fostered by NGOs (Heifer International and Send –A- Cow) whose interventions were on short term development programs with short lead periods of 3-5 years. Such farmers require a consistent and supportive long-term breeding and extension service delivery system to sustainably remain in the dairy business. There is no capacity to deliver breeding services, something only available from government veterinary offices. The general shortage of veterinary extension staff in the dairy industry in Uganda is also mentioned by the World Bank (2009) as a hindrance to the uptake of improved technologies and management practices.

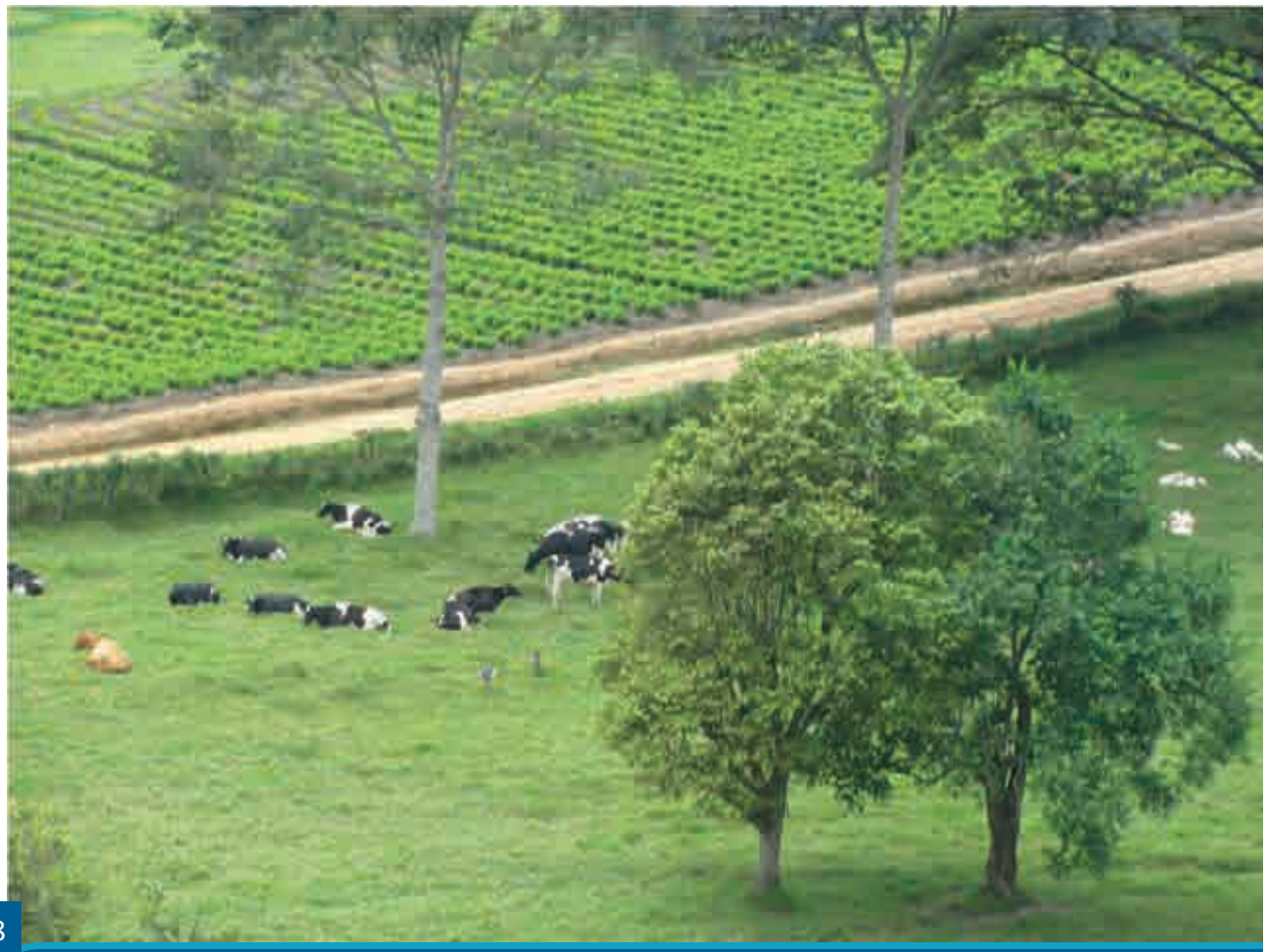
Box 12: Dairy farming system in Uganda

Characteristics	Facts /Outcome
▪ Local breeds are still dominant due to prevalence of cattle diseases ▪ Some of the diseases can be prevented or cured	▪ Advantage of local breeds over exotic is that they are resistant to diseases. ▪ The prevalent cattle diseases include: brucellosis; tuberculosis; and foot and mouth disease. There is a presence of disease vectors such as ticks & tsetse flies given the tropical environmental conditions. ▪ Farmers do not follow strict vaccination routines due to negligence or high drug costs. Cattle herds sometimes decimated with outbreaks of disease
▪ The most common system of dairy farming in Uganda is herding.	▪ Animals breed naturally and are rarely crossed with improved breeds especially in the (Eastern and Northern) regions Consequently, milk productivity is low - ▪ Common watering points are used and grass growth depends on natural factors such as rain and incipient soil fertility.
▪ In this system, cattle are grazed on communal grazing land.	▪ Individual farmers tend to maximize their private rather than social welfare, resulting into the problem of the tragedy of commons manifested by low quality of grass, overgrazing and sometimes death of cattle.

▪ There is an emergence of improved farming systems such as fencing & zero-grazing. ▪ Zero-grazing is growing in importance in peri-urban areas where few animals are kept in-house and fed with cut grass/fodder, together with dairy feed supplements.	▪ Grazing land is individualized and the farmer has the incentive to improve on the quality of grass. ▪ Planting of improved pastures and legumes is encouraged as well as; the keeping of correct stocking rates of cattle. Consequently, animal productivity is increased compared to the herding system ▪ Just like fencing, this system ensures higher animal productivity although it is laborious and limited by the number of animals kept.
▪ High costs associated with exotic breeds ▪ Requires a vibrant milk market to compensate the farmer for all production costs	▪ Elite farmers keep exotic breeds but find the purchase prices as inhibiting, plus the high maintenance cost ▪ Some farmers are reported to have reduced the No. of improved cattle & replaced them with local cattle in the wake of slow milk market conditions to cut down on production costs.

Source: Elepu (2006)

The low uptake of technologies is also linked to low farm gate prices of raw milk in relation to expensive imported inputs (like vet drugs and other vet chemicals). This was a matter of concern expressed by dairy farmers located in the South-Western milk shed. Instances where farmers switched to less price-volatile crops such as tea and bananas were sighted during field work by the EPRC research team (see picture 18 below). This might reverse the gains in milk production if the situation is not ably addressed by the Dairy Development Authority (DDA).



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Conversion of Pasture Fields to Tea Growing in Bushenyi poses threat of reversing Gains in Milk Production

10.2 Inadequate Financial Services

Many financial institutions are hesitant to finance agricultural projects, whether operated by individual farmers or by groups. For the dairy sector to succeed, mechanization is needed at all levels of the milk value chain. Bank of Uganda (BoU) and PMA (in the Agricultural Finance Yearbook 2009) entitled *'Investment-led productivity building in agricultural value chains'*, points out that access to sustainable financial services is a constraint to on-farm production, maintenance of milk quality, efficient milk bulking and transport to markets. At farm level, farmers want feed chopping equipment like chaff cutters and fodder choppers. They also need milk cans, simple milking equipment and veterinary supplies, and to continually improve the breed of their stock. Most smallholder farmers do not have the resources to make these investments. At group level, smallholder farmers need milk coolers, testing equipment and suitable storage that they can use for bulking milk, maintain good milk quality and thus increasing the shelf life before marketing. The World Bank (2009) reiterates the need to provide credit and other financial services for the purchase of inputs and improved breeding stock by dairy producers, to meet their working capital requirements ofthose involved in marketing, and to facilitate procurement of equipment and machinery by processors,. Access to credit is limited and costly.

10.3 Inadequate Milk Handling and Processing Capacity

The proliferation of ill-equipped informal milk traders estimated to handle 80 percent of the marketable milk in the country is linked to emergences of a liberal dairy industry. Milk bulking in some instances is undertaken in open places ("pick-up points") using inappropriate methods to pasteurise milk (see picture 19). The transportation of milk in aluminium and jerry cans on open pick-up trucks over long distances to the urban centres (as depicted by picture 11 in Section 7) is a common practice across the industry which compromises the quality of milk. Such problems of the industry were earlier reiterated by (Balikowa, 2004).

Milk chilling facilities are essential for the small scale dairy farmers to access the formal milk markets. The size of their operations and the geographical locations of farmsteads does not permit them to sell milk to major markets without bulking, cooling and transportation. Without a chilling plant, farmers have the traditional informal markets as their only option for selling milk, limiting their distribution to neighbours, or markets within a two-hour or 60 kilometre radius-the typical range in which un-chilled milk can travel without spoilage (BoU and PMA, 2009).

10.4 Inadequate Infrastructure

The physical infrastructure required for raw milk marketing and subsequent processing (i.e. the rural feeder and access roads, cooling facilities, electricity network) is in poor condition, particularly in the Northern and Eastern milk sheds (World Bank, 2009). On the other hand, analysis based on the NSDS data reveals that in 2004, over 80 percent of dairy farmers in the country mentioned low prices as one of the main constraints in the marketing of milk across all regions in the country (Figure 9). This was followed by poor roads and then long distances to milk markets. These constraints stem mainly from poor infrastructure network.

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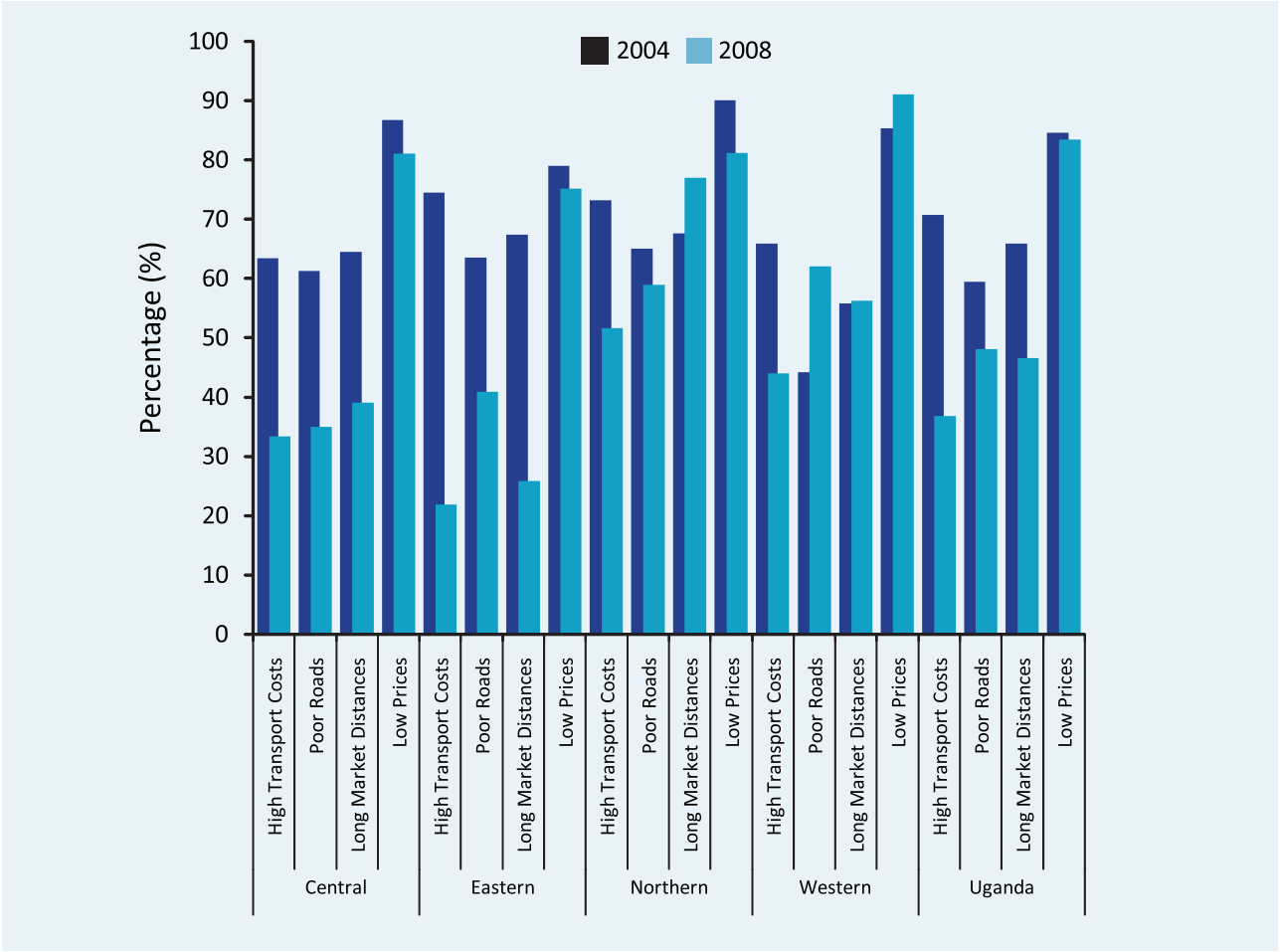
Woman pasteurizing milk in Ngora, Eastern Uganda

Figure 9: Constraints in Marketing of Raw Milk (%)



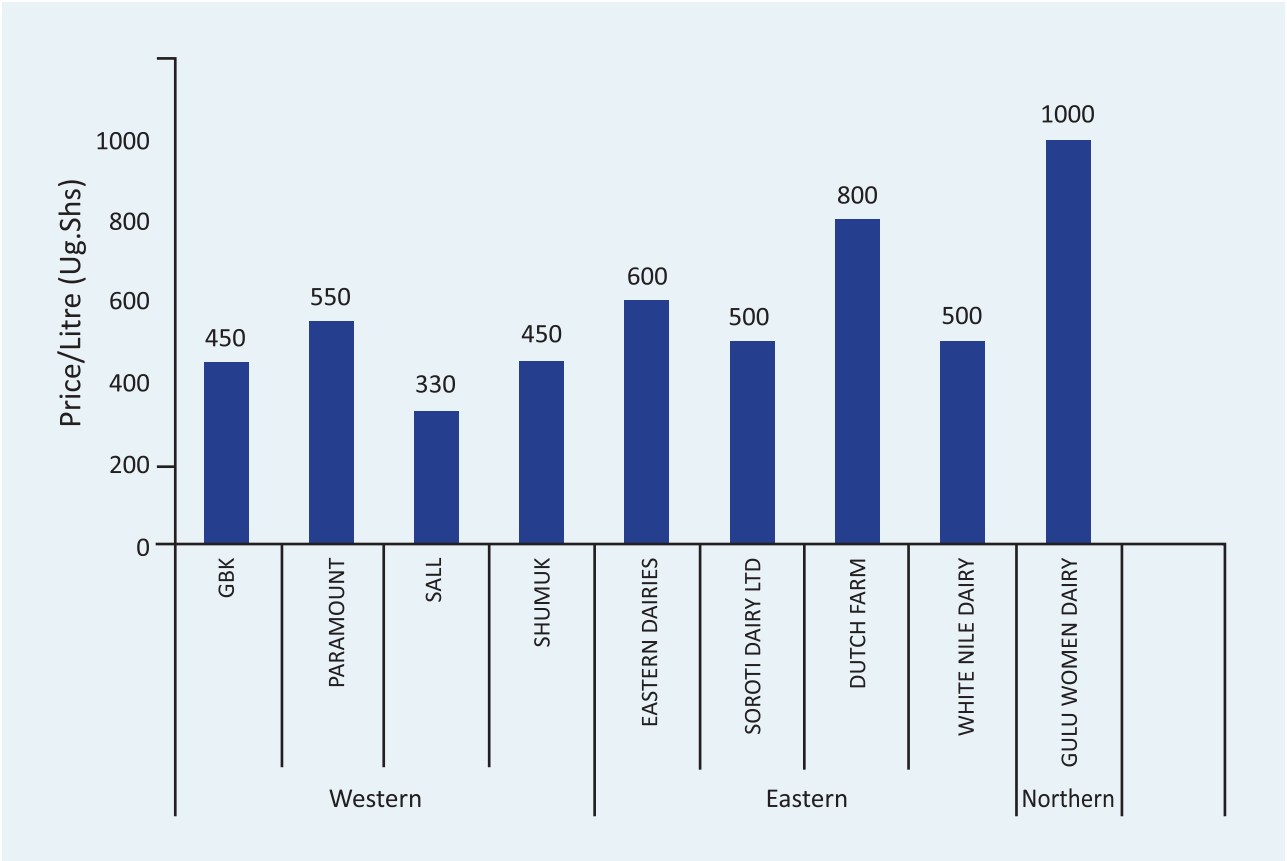
Source: Authors' calculations based on NSDS 2004 and 2008.

10.5 Limited Incentives to Enter the Formal Market Value-Chain

There is still little incentive for most smallholders to supply the formal market as opposed to the informal market (World Bank, 2009). The poor price was one of the biggest constraints mentioned by dairy farmers interviewed during the field work (Box 13). This was especially applicable in South-western region with milk surpluses. The low prices offered by SALL, the biggest player in the formal milk channel, are working against the expansion of the necessary formal milk marketing network (Figure 10). The problem of low prices offered to farmers has persisted since 2004 and was documented in 2008 (refer to Figure 9). The informal market channel is hard to regulate, thus limiting the potential for transforming the dairy sector into a highly commercialized industry.

The approach towards the informal milk sector varies from country to country. For example, the Kenya Dairy Board recognises the informal milk sector as a major entity and is helping to improve its functioning through gradual regulation. In contrast, India simply ignores and neglects the informal sector (South-South Symposium, 2009). The best option for Uganda is by having a deliberate government effort to provide an enabling policy framework to formalize the informal sector. This can be achieved by encouraging investment and introducing small milk pasteurising plants within the cooling–collection centres to encourage farmers have the milk pasteurised before transporting it to urban centres to be sold in loose form. This will cut the cost of packaging and will keep this relatively cheap milk market outlet functional.

Figure 10: Price offered by Different Processors



Source: EPRC (October, 2011) Field Work

Box 13: Constraints and suggestion for further improvement

South-western Region

Lack of Market Incentives (Low prices)

- Monopoly tendencies involving setting prices and imposing quotas on the amount of milk bought from farmers to be processed (despite existing underutilised capacity) was said to be one of the main constraints farmers faced.

- Farmers called for programmes to strengthen farmer participation and involvement along the value chain which as a way forward in curbing the monopoly tendencies of SALL. This may involve the setting up of farmer owned processing plants.

- Reducing the volume of milk sold unprocessed and marketed through the informal marketing channel would increase the volume of milk that is processed, and would create room for improving milk quality standards and capacity for the export market.

Eastern Region

- Access to farm inputs was said to be one of the main constraints farmers faced in the Eastern region. Respondents revealed that land for grazing was increasingly becoming scarce due to the increasing population and competing agriculture enterprises like rice growing. Access to good breeds is still limited, veterinary drugs are expensive compared to low milk prices and the transport infrastructure is inadequate. Milk is still largely transported on bicycles or by public means leading delays in the delivery of milk. There are few cooling plants overcome the problem milk wastages. Farmers also face the problem of cheating middlemen who fail to pay and sometimes run off with farmers' milk collecting equipment. This has led to the collapse of cool plants like the one in Gweri.

- Farmers suggested the following areas for further improvement; farmers called for programmes to improve access to farm inputs like good breeds and veterinary drugs at lower prices, improving the collection network by introducing more cooling equipment, improving the transport infrastructure and the milk marketing channels. NOTE: Attempts to introduce coolers in some places have failed due to the low quantities of milk produced. In area like Gweri (Tesso) where communal grazing is still practiced, farmers called for the construction of dips in every parish.

Northern Region

- Access to farm inputs was said to be one of the main constraints farmers faced in the Northern region. Respondents revealed the cost of treating animals is very high, AI services are at times not available, are expensive and with high failure rates. Access to good breeds is still limited, veterinary drugs are expensive compared to low milk prices and the transport infrastructure is inadequate. Milk is still largely transported on bicycles or by public means, there are few cooling plants leading delays and wastages.

- Farmers suggested the following areas for further improvement; farmers called for programmes to restock Northern Uganda with dairy breeds, improve access to farm inputs like good breeds and veterinary drugs at lower prices, improving the collection network by introducing more cooling equipment, improving the transport infrastructure and the milk marketing channels, plus providing farmers with trainings in value addition in order to be able to make other dairy products like yoghurts.

Source: EPRC (October 2011 – February 2012) Field Work

11. Recommendations to Foster Dairy Sector Growth, and Conclusions

The dairy sector is one of the agricultural sub sectors that responded well to the liberalization policies enacted in the early 1990s. There is compelling evidence of a more dynamic sector witnessing increased national milk production and expanded private sector participation and investments along the different nodes of the milk value chain. In this section, limitations to foster future growth of the dairy sector resulting from the reform process and those that are inherent in the dairy industry are identified. Plausible proposals are provided towards sustainable development of the Ugandan dairy sector along the milk value chain.

Input level

The reform of the dairy sector opened up investment opportunities across all stages of the milk value chain. At the *inputs level* of the milk value chain, there has been an increasing role of the private sector in the supply of inputs; breeding stock, veterinary drugs, supplementary feeds, and AI services. As more players join in the supply of inputs, the markets are being flooded with new and also poor quality inputs and services which are contributing to a high rate of non-adoption of critical technologies in dairy farming. Strong government regulatory measures are required to ensure quality standards in the delivery of veterinary inputs and extension services, where private sector moral hazards are detected. Such interventions are critical to halt a reversion of the gains so far achieved in the development of the dairy sector. On the other hand promotion of farmer-centred information delivery systems where dairy farmers can easily adopt best practices on the strength of evidence provided by peers in the dairy farming business needs to be promoted. Information flow is quite critical in the dairy industry and one option lies in strengthening farmer groups as institutions for information dissemination. This option fulfils the revival of cooperatives highlighted in the agricultural sector development strategy and investment plan (DSIP). The flow of information could be further strengthened via traditional radios and mass media managed by established farmer groups in liaison with local veterinary technical staff. The radio and mass media have a reach effect to dairy farmers ranging between 18 to 25 percent.

As more households enter the dairy business, knowledge gaps are becoming apparent on the relatively new technologies encountered. Likewise the husbandry livestock farming systems are evolving from extensive with local breeds to semi-intensive - improved cross breeds systems in response to the reforms. These are pointers to new challenges that need to be addressed by the government to deliver a more vibrant dairy sector. There is need to reinvigorate the regulatory framework in the functionality of the private sector in the inputs business and provision of extension services.

NGOs such as Send a Cow, Land O'Lakes and Heifer international had made positive impact on capacity building, bridging the knowledge gap especially in breeding and farmer groups institutional development. The NGOs complimented the core government public veterinary inputs and extension services; nevertheless, they operate short-term interventions independently from the existing structures of the local network of the line ministry (MAAIF). Therefore, for sustainability it is recommended that line ministry local staff work in liaison with NGO staff in the planning and execution of NGO activities.

The dairy sector reform revamped the capacity for raw milk production promoted by the growing demand for unprocessed milk and increased number of players in milk processing. In response, more households in Uganda have embraced dairy farming as a source of livelihood, and more dairy farmers have moved to improve herd productivity through the adoption of high milk yielding

cattle breeds (mainly crossbreeds) that necessitate farmers to adopt and acquaint themselves to new farming systems. This positive outcome notwithstanding, veterinary extension information challenges and knowledge gaps relating to new farming systems and new breeds of animals remain. Such challenges can be mitigated by the promotion of farmers' groups that are becoming a critical and an integral source of veterinary extension services. It is worth noting that adoption of new dairy cattle breeds varies across regions, therefore further interventions are needed to promote dairying as an enterprise that could be pivotal in poverty alleviation and source of employment in agriculture in general. The example from an Indian case study documented by the World Bank (2008) demonstrated that improving the dairy sectors in Uganda and Tanzania could contribute substantially to reducing child and maternal mortality – part of the Millennium Goals – while increasing income and employment for small rural households. More technical support from dairy specialising NGOs like; Land O'Lakes, Heifer International and Send a Cow that provided the technical support to set off the dairy industry are still required to be rolled out country wide. This needs to be integrated with the public veterinary extension services in the various regions for sustainability.

There is selective uptake of essential inputs in milk production reflected in rising adoption of veterinary drugs and lesser uptake of feed supplements and AI services in breeding. This differential adoption is a reflection of the imbalances in efforts to develop robustness in critical livestock husbandry management practices at farm level. Strong reasons (ranging from price, failure to appreciate the usefulness of such inputs, efficacy doubts on available inputs, and the growing knowledge gaps) are advanced for selective adoption. The mixed and rather poor response to AI in breeding is indicative of a haphazard breeding program in the country. These are pointers of new challenges that need to be addressed by the government in order to deliver a more sustainable dairy breeding program. The way forward is to develop a more effective and less costly AI breeding program that can be effectively delivered to the industry. Ample interventions to the unresolved breeding problems will help reposition Uganda as a breeding hub for neighbouring countries - Rwanda and DRC. There is also a rising need to reinvigorate the regulatory framework in the functionality of the private sector in the inputs business and provision of extension services.

Milk production (Farm level)

Milk production has increased at the national level mainly as a result of growing cattle numbers. The Western region remains the milk hub of the country, and productivity at farm level has improved in the Central and Eastern with the exception of Northern regions of the country. A two pronged approach can be embraced to increase milk production in the country – restocking high milk yielding cattle heads and building capacity for enhancing productivity per cow at farm level. Therefore education and sensitization programmes on dairying and milk production should be developed to target the farmers. Public investment in infrastructure including roads and electricity is necessary to support integration of the raw milk market between regions, and to spread market incentives country wide.

Milk collection and Transportation

The dividends of the reforms are clearly visible in the expanded employment opportunities in milk transportation, retailing and bulking at centres across all regions of the country through both formal and informal milk value chain nodes. This exemplifies how employment opportunities can be expanded in the agricultural sector with a view to actualizing the agricultural DISP. Naturally and as expected, the milk collection operations are more vibrant in the south-western region with surplus milk, and historically this is where most former government controlled Dairy Corporation (DC) milk collection centres were located. This network was taken over by SALL whose interest is profit driven. The challenge is with how to extend this vital network to the milk deficit regions where major milk

processing companies (like SALL, GBK and Nile Dairies) remain reluctant to invest. The solution lies in either regulating the activities of SALL - or persuading SALL having inherited the old government infrastructure, should at least be asked to exercise some form of corporate social responsibility as its obligation to the country and extend its operations country wide.

The marketing of highly perishable raw milk requires investment in the appropriate technology and equipment, but the private sector is struggling to extend the milk collection networks in the milk deficit Eastern and Northern regions. Even in the Western region, investments in milk collection infrastructure by other processing companies (GBK, Paramount, Shumuk) have not been forthcoming as expected. This leaves SALL with control of 78 percent of the formal milk marketing channel. The limited investment in milk collection network has hindered the expansion of the formal milk marketing channel, and remains the main constraint to developing and expanding the formal milk marketing channel. It is noted from the study that working in groups (cooperatives) supports investment in appropriate milk collection equipment (technology) that can be leveraged in a bid to expand milk processing in Uganda for the export market. The other option is to promote public private partnerships (PPP) arrangements to expand the milk collection network where other processors have failed to invest.

The core formal milk marketing channel of the dairy value chain is not competitive enough as had been intended by the reform policies (delivery of the right milk production and marketing incentives). The leasing of DC milk collection network (assets) to SALL after the privatisation of state assets of DC seem to have given room to one big company (SALL) to take control in setting raw milk prices and uptake quotas on volumes purchased during peak seasons (monopolistic tendencies).. The low farm gate price offered to farmers especially during the peak season in relation to the increasing prices of imported inputs (e.g. veterinary drugs and acaricides) is a big source of instability in the milk surplus South Western region where dairy farmers are left with no choice but forced to switch enterprises from dairying to crops such as tea and bananas. The prime examples are found in Bushenyi district. The situation is exacerbated by the fact that regional raw milk markets are structurally separated. Raw milk producers face prices that are solely determined by forces of demand and supply within regions of their operation. Therefore, policy considerations are required by DDA to review the dynamics in the formal milk channel. This would involve allowing strong farmers' cooperative unions to fully participate in management of milk collection infrastructure, leased to SALL by Government.

The readily available wide market for unprocessed milk has curtailed informal milk traders from entering the formal market value chain. This rampant informal market run by itinerant traders has been growing, and proves difficult for the DDA to regulate. This has restricted the utilization of existing processing capacity for many of the new plants, and has dampened the development of milk processing capacity for the export market. Therefore, innovative approaches towards upgrading the informal dairy sector by DDA should be explored, with a view to improving the quality and safety of milk sold, and to allow milk to be processed (adding value) in larger volumes. But DDA also watch out that completely closing out the informal traders, may lead to many people ending up without jobs.

Milk processing level

At the *processing level of the value chain* an enabling environment was created by opening up the dairy industry. In response, many players have joined the business of milk processing, leading to an increase in the volume of milk processed and production of a variety of dairy products previously imported. There are new players at this node of the milk value chain, but more effort is needed to unlock the milk processing potential and develop a vibrant industry. The unutilised processing

capacity can be leveraged to absorb surplus milk during peak periods in order to address the issue of fluctuating milk prices between seasons. Mini-dairies organised and managed through farmer groups (cooperatives) as exemplified in the Northern and Eastern regions can augment the level of participation of dairy farmers further along the milk value chain. Therefore programs that build technical expertise in the production of scale-neutral dairy products (cheese, yoghurts) is the way forward in improving farm incomes and creating employment in the agricultural value chains. The skills gap in dairy processing calls for training programs in dairy processing at the higher institutions of learning.

Milk consumption

The growing domestic market for milk is the corner-stone for sustainable development of dairy sector in Uganda. Processing milk into more dairy products (powdered milk, cheese, ghee, yoghurts and ice cream) is creating capacity to consume (absorb) more milk domestically. This is expected to grow with improving income levels in the country. The opportunity to export to EAC regional market has not been fully exploited.

12. Conclusions

This study provides a detailed sectoral analysis on the effectiveness of agricultural sector liberalisation policies (that took effect in the 1990s) in transforming the dairy value chain in Uganda. An audit trail of milestones reached by the Ugandan milk value chain in the post reform period shows that dairy farming is steadily growing with the number of households engaged in dairy farming increasing from 582,000 in 2005 to about 700,000 in 2009. Technological transformation has been embraced and is taking root on small-scale dairy farms, with the proportion of exotic-cross bred dairy cows to the local breed changing from 14 percent in 2005 to 21 percent in 2009 country wide. Therefore, overtime growth in national herd (from about 5 million in 1990 to 11 million heads in 2010) has had both qualitative and quantitative attributions. The available data from administrative sources cited in the study sets milk production figures at 1.6 billion litres in 2011 compared to the 356 million litres in 1991- and a detailed analysis from national representative household surveys (UNHS and UNPS), shows that milk production (from household-managed medium and small scale dairy farms) has increased from 700 million litres in 2005 to 1 billion litres in 2009/10. Milk processing capacity is expanding, and with increased value addition by producing more dairy products along the milk value. The growing domestic demand for milk and other dairy products has allowed more absorption of milk in the domestic market. The above outcomes from the changing policy framework and transformation of dairy industry value chain in Uganda is summarised in Figure 11. In conclusion, the smallholder farmers can profoundly benefit from dairy farming if given appropriate support. The development of the dairy industry would provide additional sustainable soil management practices in crop farming through nutrient recycling, and provision of alternative energy sources from biogas as illustrated by picture 20 and 21.

20

Evidence of synergies between Dairying & Crop farming.

21

Biogas from dairy cattle is an alternative source of energy

Figure 11: Changing Policy Framework and Transformation of Dairy Industry Value Chain

Inputs	Production	Collection	Processing & Marketing	Consumption	
• National herd decimated by civil strife. • Gov't mandate to provide inputs: (i) Drugs & AI services through gov't agents only (ii) Import & Stock exotic breeds. • Farms depended on for breeding; (i) Local market-heifers (ii) Natural breeding	• National annual milk production was less than 450 million liters by 1980	• DC monopoly of the formal milk collection • Collapse of DC Drop in Annual Milk collection	• One operational plant –DC	• Earlier in 80s per capita milk consumption was about 16 liters	Before Liberalization
			 		
• Improve productivity; (i) Adoption of Exotic & crossbreds); use of AI/exotic bulls. (ii) 1.6 million cattle (21%) exotic – 71% (6.5million cattle) still local (iii) Improve management; intensive or semi intensive for extensive grazing; tick & tsetse control. • Source of breeding inputs widened; (i) NGO; (Heifer project; Send a cow) (ii) Private sector investments in drag supplies (iii) Development partners (USAID; Land O'Lakes; ADB)	• 52% milk is marketed 48% consumed on farm • Bulk 80% milk pdn from local breds on mixed farms (not specialized) dairy units. • 16% pdn from improved cattle breeds. • Ltd no. of Commercial farms (herds of exotic cows • Sign. Output from zero-grazing units	• Raw milk is transported by large no. of informal operators on foot & bicycles • itinerant traders now use aluminium/stainless steel cans instead of plastic • Private traders with insulated milk tankers • About 268 cooling centres in western and 14 in eastern • 90% cooling located (Central & Western) region[9]	• Informal marketing channel handles 80-90% sold; • Sizable private sector investment • 9 big/medium operational processing plants; 3 for UHT & 1 milk powder plant • 20 micro-scale processors • Shops & Supermarkets still sell imported UHT/powdered milk and other dairy products • DDA - effort to integrate Informal Sector[10]& formal Sector. • Improve Milk Quality & Safety. • Milk Traders Trained in Hygienic milk handling practiceS	• Per capita milk consumption 58 litres; • Improved Milk Quality & Safety	Post Liberalization

Lessons learned

An opportunity is provided by this study to document a success story of a value chain in agriculture that has emerged following the agricultural liberalization policies in Uganda. This section highlights lessons from the study that can be replicated to foster development in other agricultural subsectors. The lessons are useful in thinking about the prospects of the strategic vision in the 2010/2015 Development Strategy and Investment Plan (DISP) for agricultural development that MAAIF is currently pursuing which lays strong emphasis on the development of agricultural value chain.

It is important to note that the success in the milk value chain is also attributed to the unique characteristics of milk as a product- milk allows a farmer to earn an income daily (both in the morning and evening) and its perishability gives limited leeway in marketing, therefore compelling the working in groups (cooperatives) to maximise benefits. The market for milk is readily available in the domestic market. However, the study provides lessons that can inform the development of process of agricultural value chains. The captivated lessons are that;

- The private sector can direct resources by availing innovations and technologies on the market. But unregulated private sector driven input markets and service delivery increases farmers' exposure to risks which can be deterrence in the uptake of appropriate technologies.

- Farmer to farmer consultations enable the flow of market information on essential inputs, therefore farmer-centred institutions are handy in the transfer of information on technologies where demonstrated evidence on efficacy is required. The traditional FM radios and wider media can be used to widen the agricultural extension information dissemination.

- NGOs with proven expertise in specific agricultural technologies can bridge the gap for capacity building where public extension support services prove inadequate to match the increased demand for the right agricultural technological interventions.

- Intensification in adoption of better technologies leads to increased output. Farmers respond positively in the uptake of agricultural technologies that result in increased income, and market incentives augment the uptake of yield enhancing technologies. Where expansion is possible, production can be stepped up by drawing more land into agricultural production especially in the less populated regions in the Northern Uganda.

- Farmers are rational and resort to selective adoption of innovations leaving out technologies where incremental production costs outstrip additional income benefits (as was in case of feed supplements in dairy and AI services).

- The absence of supportive systems might deter the adoption of appropriate technologies. This could lead to reversal of productivity gains after a right intervention. This was the case in Northern region (in particular Nebbi district) where milk prices are high, but failure to address sustainability and follow up activities of AI services curtailed the Women group - beneficiaries of the zero grazing project that was initiated by Send A Cow to expand milk production.

- The use of one innovation may set grounds for a new innovation. For example improved milk productivity led to market development and increased demand for more dairy products. Therefore innovations should be applied along the entire agricultural value chain to maximise agricultural sector development.

- Value chain promotion can generate development impacts and indirect poverty impacts via rural employment creation.

- Value chains with integrated bulking/storage, transportation and marketing infrastructure can be leveraged to develop formality in agricultural processing and value addition. Right investment incentives should be engineered to encourage the private sector to invest in agricultural values chains. This could be initiated via private public partnerships (PPP) that could be fully privatised in the long run. Important lesson can be drawn from the former government owned Dairy Corporation (DC) assets privatised and leased to Sameer Agricultural Livestock Limited (SALL) a private company.

- The private sector investments in agriculture tend to be clustered in geographical regions where upstream production activities are concentrated, and where the downstream marketing activities converge. Such regions for the other agricultural crop commodities need to be identified to inform the planning process.

- Targeting the domestic market in processing and value addition leads to an expanded market of agricultural raw materials and can be leveraged in developing capacity to produce for the export market.

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Appendix A

2004 NSDS Statistics on Policy Initiatives

Table A 1: Information about PMA Activities (% of dairy households reporting knowledge levels about the PMA activities in 2004

Region	PMA Activities				
	Overall	*Training*	*Advocacy Services*	*Marketing*	*Others*
Central	47.1	53.9	39.2	11.0	14.5
Eastern	53.7	42.4	47.9	24.9	8.11
Northern	41.9	56.7	53.8	33.8	5.8
Western	47.8	74.2	33.5	15.2	8.7
Uganda	48.8	52.9	44.7	22.1	9.0

Source: Authors' computations from the 2004 National Service Delivery Survey

Table A 2: Sources and Access to Livestock health enhancement Information in the Dairy Industry

	Assessment (%) of Sources of Information on Disease Control													
	2005/06							2009/10						
	No access	*Extension*	*NAADS*	*mass media*	*other farmers*	*other*	*Total*	*Coops*	*Input Supplier*	*NGO*	*NAADS*	*other farmers*	*other*	*Total*
														100
Central	61.2	0.0	0.0	25.5	8.8	4.5	*100*	6.6	0.0	16.1	44.2	12.0	21.1	*100*
Eastern	42.9	11.8	5.4	13.9	26.0	0.0	*100*	6.7	3.0	17.2	72.9	0.0	0.0	*100*
Northern	34.9	0.0	0.0	21.7	43.5	0.0	*100*	0.0	0.0	34.4	65.6	0.0	0.0	*100*
Western	64.4	0.0	0.0	7.5	28.1	0.0	*100*	0.0	0.0	13.8	86.3	0.0	0.0	*100*
Uganda	55.1	3.1	1.4	15.5	23.5	1.3	*100*	5.11	1.6	18.9	66.9	2.7	4.8	*Total*

Source: Authors' computations from the 2005/06 UNHS & UNPS 2009/10

Appendix B

Table 1B: Farming Experience (Group Range Years) and Insights Gathered from Farmer Focus Group Discussions on Herd Composition and Productivity Before and After Dairy Sector Reform in the Eastern Region

Location and Socio-Economic Characteristics for Members of Focus Group (FGD)					Before Reform (2000)				Post Reform Period			
Region	District	FGD/Location	Farming Experience (Years)	Cattle Type (Breed)	Farm / Herd Size			Litres/ cow/ day	Farm / Herd Size			Litres/ cow/ day
					Small	Medium	Large		Small	Medium	Large	
Eastern:												
	Kamuli	Nawanyago Dairy Farmers	8-42	local	1	25	40	3	-	-	-	-
				Cross/exotic	-	-	-	-	1	5	40	8-10
	Soroti	Gweri Dairy Farmers	1-10	Local	10	30-50	100-300		1	10-30	40-50	1-2
				Cross/exotic					1	2	5	5
	Bududa	Bushika	1-30	local	1	5	30	2	-	-	-	-
				Cross/exotic					1	2	4	10-15
	Sironko	Kadweredwera	1-18	Local	1	5	10	2	1	2-3	5	3-4
				Cross/exotic					2	3	6-10	7-10
	Ngora	Ngora Progressive	5-9	Local	1-2	5-7	15-20	2	4	10	20	2
				Cross/exotic					1	2	5	4-5

Source: EPRC (October, 2011) Field Work

Table 2B: Farming Experience (Group Range Years) and Insights Gathered from farmers' Focus Group Discussions on Herd Composition and Productivity Before and After Dairy Sector Reform in the Northern Region

Location and Socio-Economic Characteristics for Members Focus Group (FGD)					Before Reform				Post Reform Period			
Region	District	FGD/ Location	Farming Experience (Years)	Cattle Type (Breed)	Farm / Herd Size			Litres/ Cow/ Day	Farm / Herd Size			Litres/ cow/ day
					Small	Medium	Large		Small	Medium	Large	
Northern:												
	Gulu	Gulu Women Dairy Coop	2-10	local	-	-	-	-	-	-	-	-
				Cross/ exotic	-	-	-	-	1	3-5	15	8-10
	Gulu	Gulu Progressive Dairy	2-4	Local	-	-	-	-	-	-	-	-
				Cross/ exotic	-	-	-	-	1	3	5	8-10
	Apac	Aduku/ Kwania Dairy Coop	1-6	local	1	5	20	2	5	10	20	2
				Cross/ exotic	-	-	-	-	1	3-5	15	8-10
	Nebi	Women group	3-6	Local	-	-	-	-	10	30	30+	2-5
				Cross/ exotic	-	-	-	-	1	2-3	4-5	10-20
	Nebi	Lakicke Dairy Farm	6	Local	-	-	-	-	5-10	20	30	1
				Cross/ exotic	-	-	-	-	1	2	3	6-8

Source: EPRC (February, 2012) Field Work

Table 3B: Farming Experience (Group Range Years) and Insights Gathered from farmers' Focus Group Discussions on Herd Composition and Productivity Before and After Dairy Sector Reform in the Western Region

Location and Socio-Economic Characteristics for Members of Focus Group (FGD)					Before Reform				Post Reform Period			
Region	District	FGD/ Location	Farming Experience (Years)	Cattle Type (Breed)	Farm / Herd Size			Litres/ cow/ day	Farm / Herd Size			Litres/ cow/ day
					Small	Medium	Large		Small	Medium	Large	
Western:												
	Mbarara	Rukaka Dairy-Rubindi	8-43	local	10	30-50	200-500		-	-	-	-
				Cross/ exotic	-	-	-	-	5	20	50-100	
	Mbarara	Informal Group-Rubindi	3-18	Local	10	30	80-100	2				
				Cross/ exotic	3	5	15	4	5	15	30-50	5-8
	Mbarara	Informal Group-Bwizibwera	10-50	local	5-10	50-100	600+	10+	-	-	-	-
				Cross/ exotic	2-5	15-40	50		50	80	150-200	10-15
	Shema	Kyangyenyi Dairy-Kakindu	10-50	Local	5-10	10-20	30-50	3	-	-	-	-
				Cross/ exotic	5-10	20-40	40-70	8-10	5	5-10	30-50	8-10
	Ntungamo	NDAFCU Farmers-Municipality	7-40	Local	40			3	-	-	-	-
				Cross/ exotic			20	6		15-20	80-100	10

Source: EPRC (October, 2011) Field Work

List of Key informants

South-western Uganda

1. Mugura Daniel - Supply Coordinator - UCCCU (Mbarara)
2. Michael Mabati - Chairman – Rukaka Dairy (Rubindi-Mbarara)
3. Moses Mwebaze – Chairman – (Bwizibwera –Mbarara)
4. Kaddu Silver – Secretary manager- Ntungamo Dairy farmers' Coop Union (Ntungamo)
5. The executive of NDAFCU
6. The executive of Shema dairy farmers coop market enterprise Ltd.
7. The DVO Mbarara District
8. George Nuwagira Chairman UCCCU
9. Tumwebaze Godwin – Operations Manager (GBK Dairy) – Mbarara District (Processor)
10. John Anglin – Managing Director – Paramount Cheese
11. Robert Munangyera – Centre Manager – Sibyangu Dairy Supplier (Milk Trader) Mbarara
12. Batarugaya Benson – Milk Retailor – Kagango Dairy Farm (Ntungamo)
13. Mugarura Johnson –Milk Retailor – J & J Mutanoga Fresh Milk (Mbarara)
14. Rutasinzira Stephen – Milk Retailor – Amatte Malungi (Mbarara)

Eastern

1. DVO Kamuli District
2. The exectutive committee – Gweri Dairy and Mixed Farmers Association/Coop. (Soroti District)
3. The executive – Nawanyago Dairy farmers Association (Kamuli district)
4. Fred Mawumbe – Chairman – Eastern Dairies (Mbale)
5. Martin Sokoton- Eastern Dairies (Mbale)
6. Wakwale Godfrey – AI Technician (private inseminator) (Mbale)
7. Wanda Shadrak – Production Officer- Eastern Dairies (Processor) (Mbale)
8. Mutuya Abumelech – Milk Retailor, Nawanyago - Kamuli
9. Wakale Willy – Sales Manager- Eastern Dairies (Mbale)
10. Isanga David – Director- Ndemera Dairy Farmers Association (Milk Trader) Kamuli
11. Kaianzo Bosco – Manager- Ndemera Dairy Farmers Association (Milk Trader) Kamuli
12. Noah Nakida – Milk Collector- Eastern Dairies (Mbale)
13. Majoro Frank – Milk Trader- Soroti
14. Mr. Batwagaine – Chairman – Nawanyago Dairy farmers Association (Kamuli district)
15. Kaijanzo Bosco (manager) and Isanga David (director) – Ndemera Dairy Farmers' Association (kamuli district)
16. Etyangat Scholastica – Director and Production Manager – soroti Dairy Ltd. (Soroti) (Processor)
17. Dr. Eryodu – DVO Soroti
18. Mutalya Yeseri – Milk Trader/Retailor – Nawanyago (Kamuli)
19. Etyarya O. Leonard – Director- Soroti Dairy (Milk Trader)
20. Francis Erau- Operations Manager- Soroti Dairy (Milk Trader) (Soroti)

Northern

1. Fred Kusakala – Milk Retailor – Fred Dairy Fresh Milk (Apac)
2. Dr. Komakech Micheal – Livestock Specialist- Heifer Project International (Gulu)
3. Richard Olanya – Director- Gulu Milk Supply Ltd. (Gulu)
4. DVO – Apac
5. DVO – Nebbi
6. Kasangwa John – (Milk Retailor) Moonset Dairy (Gulu)

7. Executive – Gulu Dairy Farmers Union (Gulu)
8. Margret Odwar – Chairperson – Gulu Women Coop. Soceity.
9. Executive- Kwania Dairy Coop. Soceity Ltd. (Apac/Kwania)

Input Dealers (South-Western Uganda)

1. Edmond Rugunda, Director Keirungi Farm (Breeder) (Mbarara District)
2. George Nuwagira, Chairman UCCCU (Breeder/ AI Service Provider), Kabwohe Artificial Insemination Centre (Shema/Bushenyi)
3. Dr. Tuwangye Innocent, Technical Rep. South Western Region, Quality Chemicals (Mbarara)
4. Dr. Ayudo Hellen Jane – Program Head, Extension Services for Development (SOCADIDO) Soroti Catholic Dioceses Intergrated Development Organisation
5. Kunnya Godfrey – Vet Drugs Shop Retailor (Kamuli)
6. Musalwa Balaam – AI Technician (Kamuli)
7. Dr. Opolot and Emukeu Samuel - Director and MD – Wilcon Enterprises (Soroti)
8. Omara Ronald – Manager- El-Shaddai Vet Drug (Apac)
9. Dr. Opeto Dickens – AI Service Provider (Apac)
10. Oketayot Joseph – AI Technician/Extension Officer – Gulu Women Dairy Farmers Association (Gulu)

Focus Group Discussions

1. Rukaka Dairy Farmers Coop. Society Ltd. (Mbarara)
2. Informal Group (Bwizibwera- Mbarara)
3. Informal Group (Rubindi- Mbarara)
4. Informal Group (Kakindu – Shema)
5. Kadweradwera Farm Group (Sironko)
6. Bishika Association (Bududa)
7. Gweri Dairy Farmers Association (Soroti)
8. Nawanyago Dairy Farmers Association (Kamuli)
9. NDAFCU (Ntungamo)
10. Ngora Progressive Dairy Farmers Coop.
11. Aduku Dairy Coop. Soceity Ltd – (Apac)
12. Kwania Dairy Coop. Soceity – (Kwania/Apac)
13. Lakicke Dairy Farm (Nebbi)--- Informal
14. Women Group- Beneficiaries of Send A Cow (Nebbi)
15. Gulu Women Dairy Coop. (Gulu)
16. Gulu Progressive Dairy Farmers Coop. society Ltd. (Gulu)

Appendix

Milk Production (million litres) & Cattle Numbers ('000) from 1990-2010

Table A1: Trends in Milk Production and Cattle Numbers in Uganda (1990-2010

Year	Milk Production	Cattle Numbers
	(Million litre)	Thousands"
1990	481	4,950
1991	365	5,121
1992	511	5,209
1993	548	5,370
1994	532	5,106
1995	551	5,250
1996	572	5,500
1997	593	5,460
1998	615	5,651
1999	638	5,820
2000	700	5,966
2001	900	6,144
2002	1,000	6,283
2003	1,100	6,558
2004	1,200	6,567
2005	1,300	6,770
2006	1,400	6,973
2007	1,500	7,182
2008	1,400	11,409
2009	1,450	11,751
2010	1.500	

The Milk Value Chain

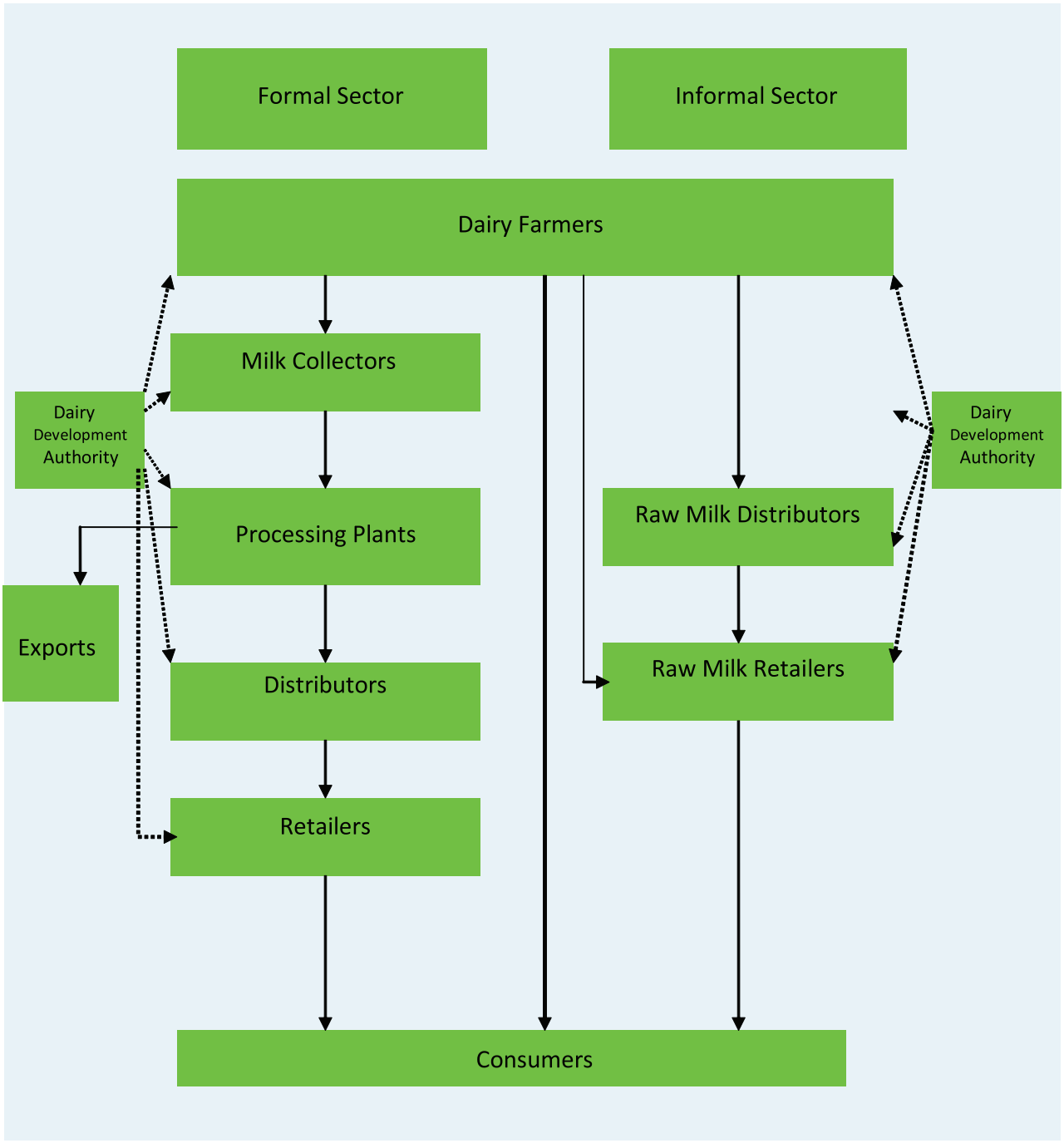

Figure A1: Milk Value Chain in Uganda

Table A2: Milk Balance Sheet (Production, Processing & Consumption ('000litres)

Year	Production	Consumption	
		Processed	Unprocessed
1990	481.000	17.319	-
1991	365.000	21.199	-
1992	511.000	22.705	-
1993	548.000	25.880	-
1994	532.000	27.671	-
1995	551.000	23.601	-
1996	572.000	26.894	-
1997	593.000	27.468	-
1998	615.000	32.405	-
1999	638.000	26.494	-
2000	700.000	19.303	-
2001	900.000	18.332	658.000
2002	1.000.000	17.522	732.000
2003	1.100.000	14.930	809.000
2004	1.200.000	19.553	876.000
2005	1.300.000	18.490	950.000
2006	1.400.000	-	1.023.000
2007	1.500.000	-	1.094.000
2008	1.400.000	-	-
2009	1.450.000	-	-
2010	1.500.000	-	-
2011	1.600.000	-	-
Sources	*Twinamasiko (2001); DDA (2006); EPRC (2009) Land O'Lakes/USAID 2006*	MFEP, Background to the Budget (1996/97) UBoS, Statistical Abstracts Series; (1999,2004, 2006, 2008, 2009)	World Bank (2009)

Table A3: Institutions Important in Dairy Sector Reform

Business Associates & Institution	Role & Contribution
1. Uganda National Bureau of Standards (UNBS);	• Sets national standards for products and their enforcement;
2. United Nations Industrial Development Organization (UNIDO)	• Training in the dairy industry;
3. National Animal Genetic Resources Centre and Data Bank (NAGRC & DB)	• The custodian of the animal breeding policy;
4. National Agricultural Research Organization (NARO)	• National body with the statutory mandate to undertake, promote and co-ordinate research in all aspects of crops, fisheries, forestry and livestock and to ensure the dissemination and application of research results;
5. Uganda Export Promotion Board (UEPB)	• Advises government on export and products that can fetch foreign exchange. UEPB also looks for markets for Ugandan products abroad;
6. Uganda Investment Authority (UIA)	• Advises investors on sectors/ areas for investment;
7. Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	• the parent ministry of the dairy sector which designs all government policies aimed at promoting development in the dairy sector
8. Development partners	• development partners in the dairy sector that support different programmes
9. Uganda National Dairy Farmers Association (UNDFA)	• The national umbrella body for dairy farmers;
10. Uganda Crane Creameries Co-operative Union (UCCCU)	• the national umbrella body for dairy co-operatives in Uganda, registered as a union under the Co-operative Societies Statute;
11. Uganda Dairy Processors Association (UDPA)	• Brings together big and small dairy processing companies; and
12. Uganda National Dairy Traders Association (UNDTA)	• Mainly for traders that are involved in procurement and marketing of raw milk.

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