ALAN KING AND ASSOCIATES

PO BOX 42843
00100 NAIROBI
KENYA

FINAL EVALUATION OF THE DAIRY CONSORTIUM ACTIVITY 2001-2004 UGANDA

FINAL REPORT

PREPARED FOR USAID/UGANDA

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A comprehensive series of interviews and field visits was undertaken to the central, western, eastern and northern regions of the country which provided a sound basis for the findings and recommendations. It is to these farmers (and their families), processors, technicians, bulking groups, cooperative groups, input supply companies, industry associations, AI technicians, staff of other projects, MAAIF, DDA, DCL and numerous NGOs that particular thanks are extended. Without these contributions a meaningful evaluation would not have been possible.

ABBREVIATIONS AND ACRONYMS

ADP	Ankole Dairy Products Company
AI	Artificial Insemination
BUDICU	Bushenyi Dairy Industry Cooperative Union
DCL	Dairy Corporation Ltd
DDA	Dairy Development Authority
GDA	Global Development Alliance
HACCP	Hazard Analysis Critical Control Point
HPI	Heifer Project International
IDEA	Investment in Developing Export Agriculture Project
IEE	Initial Environmental Examination
INKA	Ibanda, Ishongororo, Igorora, Nyabuhikye, Nkoma, Kabujogyera, Kanoni and Kicwamba Association
IR	Intermediate Result (of USAID)
IRR	Internal Rate of Return
LOL	Land O'Lakes, Inc.
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MADDO	Masaka Diocese Development Organisation
MCC	Milk Collection Centre
M&E	Monitoring and Evaluation
MEDA	Menonite Development Association
NAADS	National Agricultural Advisory Service
NAGRC & DB	National Animal Genetic Resources Centre and Data Bank (formerly Animal Breeding Centre).
NARO	National Agricultural Research Organisation
NDAFCU	Ntungamo Dairy Farmers Cooperative Union
PEAP	Poverty Eradication Action Plan
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
PMA	Plan for the Modernisation of Agriculture
PMP	Performance Monitoring Plan
PRIME/West	Productive Resource Investments for Managing the Environment/Western Uganda Project
RATES	Regional Agricultural Trade Expansion Support Program
SCOPE	Strengthening the Competitiveness of Private Enterprise Project
SO	Strategic Objective (of USAID)
UEPB	Uganda Export Promotion Board
UNDAFA	Uganda National Dairy Farmers Association
USAID	United States Agency for International Development
UVA	Uganda Veterinary Association
WWS	World Wide Sires
YWCA	Young Womens Christian Association

EXECUTIVE SUMMARY

This final evaluation of the Uganda Private Sector Dairy Industry Development Activity was carried out between 26 April through 26 May 2004 by a four-person team. The dairy activity was carried out by a consortium consisting of Land O'Lakes, Heifer Project International and World Wide Sires. As well as a review of documents, the evaluation team carried out extensive field visits in the west, central, east and north of the country, dividing into groups to achieve a wide coverage in which nearly 200 persons were personally contacted. As two members of the team were Ugandan, the ability to converse in the local language added considerably to the value of the field visits. Those visited included farmers, producer groups, processors, service providers, input supply companies, consortium clients, GoU officials and organisations such as the Dairy Development Authority and Dairy Corporation, and NGOs.

The evaluation was required to broadly focus on: a) the extent to which the objectives of the project have been met by the consortium; b) issues arising from project implementation and lessons learned which can guide any future programs; c) project impact on the marketing chain, particularly the effect of consortium efforts on household incomes; d) examination of constraints which appeared during project implementation and methods used to overcome them; e) identification of activities which were in the program but which were not initiated or completed; f) provision of an overview of the dairy sector with recommendations on what further investments need to be made, and where USAID might play a role.

1. Extent to which project objectives have been met

The objectives of the project, to increase incomes for rural dairy farmers and to increase dairy sector competitiveness and productivity, have been largely met. In many areas targets were exceeded even after two years such as more heifers distributed and more beneficiaries trained. In Western Uganda, where LOL has had its greatest impact the volume of milk received by the bulking centres/farmer associations has increased by about 285% from an average of 1,384 litres three years ago to the current average of 6,233 litres. Regarding milk consumption and milk exports, although increases were achieved, the level of increase was lower than targeted – largely for reasons outside the control of the consortium. These reasons are provided in brief under 'Constraints to project implementation' (point 4 below) and in more detail in the relevant sections of the main report as well as in comments in Table 2. It was clear from the many responses during field visits, and from GoU and NGOs that clients are generally satisfied with the quality of assistance and advice provided by the consortium. Its activities have also led to important improvements in natural resource management and employment. Also, while data are insufficient, discussions in the field such as with HIV positive families indicated improvements in health and reduced instances of nutritionally related diseases such as kwashiorkor. The project is much appreciated by beneficiaries because it enhances family incomes, food safety and welfare. District administrators appreciated the project for its potential to increase regional milk availability, in reducing rural poverty, creating agro-based employment, and addressing gender balance issues.

Business level impact was significant particularly for value-added products: Sales of yoghurt, ice cream, cheese, and dairy cream increased by 245% from 2001 to 2003. 70 new or improved products were marketed up to March 2004. LOL was involved in all of them through support to the processors and all 70 are still on the market. Industry organisation was enhanced through consortium interventions which helped to create 59 new enterprises (post harvest) in the dairy sector and 373 new jobs created. 41 of the new enterprises were farmers cooperatives some of which took over operation of milk cooling and collection centres and leased the milk cooling tanks from DCL. Membership of cooperatives, farmers' groups and stakeholder associations increased by 89%, above the target of 75% after two years. Many supported cooperatives showed a rising trend in revenue and gross margins – see for example Figures 2 and 3 for Ntungamo Dairy Farmers Cooperative Union.

During 2001-3, heifers purchased with project funds and distributed by HPI, totalled 910 at the time of this evaluation (see Appendix 7)and will rise, according to HPI, to 1,013 by end of project because of extra funds available through changes in exchange rates. Only 20 heifers were 'passed on'. This was normal because farmers took 6 months to prepare the zero grazing unit and be trained, heifers arrived mainly during years 2 and 3, and calves were born and raised to at least one year of age before being passed on. 284 females were being raised to be passed on over the next 12-24 months.

2. Issues arising from project implementation and lessons learned

Project implementation has been timely. Grouping LOL, HPI and WWS into a consortium has been beneficial for clients as each has contributed to improving their welfare. As a consortium each was in a better position to interact to assist clients in a more holistic manner. However, for M&E the implementation of a single reporting procedure in quarterly and annual reports has made it less easy to see what each consortium member has done. A new M&E system for production issues was introduced in 2002 in which a representative sample of participating farmers (about 11% of the total participants) plus some 'commercial farmers' were monitored. So results such as the increase in availability of milk, and in household incomes, in the east and north, were calculated from the 11% of participants. The reliability of such figures depended, therefore, on how the sample was chosen and how representative they were. Evidence indicates that they were representative. HPI and WWS continued to keep production records from all participants such as milk production, sales, animal management and health. It would be a valuable exercise if LOL would analyse all the data for the three years to provide an overall picture of results.

Clients would benefit from increased consortium presence on the ground in the east and north for assistance with production, processing and marketing, to follow up the in-calf heifer distribution there. Even so, the number of in-calf heifers distributed there was small for theinterest the project generated and more are required to help address the continuing milk deficit there. Some aspects of animal management were observed to be capable of improvement, such as nutrition and construction of the zero grazing unit as detailed in this report. Policies on the continuing ban on importation of genetics need to be re-examined (see sections 5.2 and 5.3).

Regarding milk deficit areas there is need to investigate further the economics of moving milk within the country: surplus to deficit areas as a short-term strategy. Some private companies are doing so profitably, for example moving milk from Mbarara to Jinja for Ush50/liter. There is a need to engage the informal milk sector more closely with a view to improving milk quality. It was found that promotional activities by LOL have impacted consumer awareness and tastes and these should be continued particularly with school children. The issue of increasing milk exports has been the focus of favourable studies by the consortium and further inputs are required to examine the remaining barriers to implementation.

3. Project impact on marketing chain particularly the effect on household incomes

There has been a positive impact on household incomes for beneficiaries of heifers and for many of those who were assisted to establish farmer groups geared towards milk marketing and processing. After only 2 years average productivity in milk production had increased by 25% per animal per day of participating farmers. Cost of production per liter also declined by an impressive 49%. Availability of milk and milk products in the targeted areas of the north and east increased by 11.6 million liters. Assisted by support from LOL the volume of milk entering the cold storage/bulking system increased by 75,520 liters/day. Sales of value added products (yoghurt, ice cream, cheese and dairy cream) have been particularly impressive, having risen by245% in two years. In the post production dairy sector 59 new enterprises and 373 new jobs were created. These achievements were underpinned by an 89% increase in active membership of democratically-run farmers groups/associations and cooperatives for which training was provided. Competitiveness of dairy enterprises was increased by LOL assisting with the development of 10 bankable business, and revision of 3 others, for producer groups and microprocessors.

The provision of coolers for milk bulking has also reduced milk losses and enabled farmer groups to manage their marketing activities more successfully. LOL has assisted DDA to enforce the banning of open boiling of milk and of the transporting of milk in plastic jerrycans which have been replaced by milk cans which can be cleaned efficiently. These are important impacts on the marketing chain in terms of efficiency and health.

Sales of pasteurised milk increased by 6.5 million liters (38%) which does not include the sales of Jesa Dairy Farm whose sales figures were not supplied to LOL. UHT milk sales declined by 1.4 million liters (19%) mainly because of business constraints at some major processors as well as a shortage of packaging materials. Exports also increased and studies by LOL indicated potential for further sales in the region.

The impact of the use of AI has had an important effect on household incomes. Through use of high quality semen the productivity of heifers and their offspring has led to increases in milk yield, sales and rural incomes. This has been amplified as heifer calves are passed on through the HPI system. In-calf heifer beneficiaries who train and adopt the project methodologies may be rewarded three time their investment from milk sales, progeny value and use of manure in three years. The financial benefits are higher if advantages in better family food security, farm natural resource management and diversification are also taken into account. The multiplier effect on regional milk availability from the 910 heifers distributed in the east and north in the three years will consecutively rise from 0.8 to 39 million liters a year over ten years. Progeny born into the project, or which are distributed, help to increase the national dairy herd. The heifer acts as a catalyst that induces farmers to engage in pro-environment protection technologies more easily than they would if they had no heifer. Farmer training programmes and follow-up visits from project extension and headquarters staff create a cadre of producers that are better-informed in animal husbandry, environmental protection, on-farm income generating activities, and other topics such as leadership and HIV/AIDS awareness.

4. Constraints during project implementation and methods used to overcome them

These were relatively few compared with the large number of activities undertaken by the consortium. UHT milk production did not reach the targeted level mainly because expected capacity changed after activities started in 2001. One major processor, GBK, lost a UHT line and another, Alpha Dairy experienced delays in installing its UHT line. Lack of packaging capacity for UHT-milk also constrained increase in consumption - the domestic consumption of UHT-milk has gone down by about the same volume as the export of UHT-milk has increased. Lack of funding for the processors to purchase packaging material for UHT-milk before processing contributed to the low sales. Prices of packaging material is up to 20 % of sale value of UHT milk.

According to discussions with macro-processors the viability and utilisation of installed capacity for macro-processors was greatly reduced by unreliable supply of electricity/water and the high cost of running generators, though this has not been quantified.

Occasionally AI services were disrupted due to difficulties in upcountry delivery of liquid nitrogen. Encouraging the formation of regional private AI service centres that serve groups of area inseminators helped to improve the delivery of AI and other services. The consortium hired a consultant in May 2004 to address this issue and his report is awaited.

Some producers had problems in selling their milk and in debt collection. As a result some producer groups accessed loans to buy coolers for bulking in order to ease the marketing problems. The adoption rate for some technologies has not been uniform and some farmers have failed to perform up to expectation, as detailed later. To address these issues HPI has helped to establish local project committees to administer the HPI model, and some producer groups have zones supervised by zone committees.

These local project administrative structures significantly help to apply peer pressure on members, to improve implementation rates, and to meet deadlines.

Security in northern Uganda hampered wider distribution of in-calf heifers in target districts. This was minimised by concentrating on peri-urban areas. These will be the catalyst to improve local production as the situation improves.

5. Program activities which were unable to be initiated or completed

Many IEE and PERSUAP indicators were monitored and documented. The few which were not were: *LOL: Compliance with IEE and PERSUAP directives*: For new product development the number of processors and production staff trained in environmentally-friendly processes, additives and packages were not monitored. For pesticide use there was no monitoring of the number of meetings held with the National Drug Authority and Agricultural Chemicals Board to support streamlining of pesticide registration and keeping track of acaricide registration status. No meetings were held and the consortium found that all pesticides used were already registered in the USA. It also confirmed that HPI used only the two permitted chemicals as pour-on treatment for cattle. For importation and use of genetics and genetic equipment to be used as per GoU laws and regulations: genetics (semen) complied, but equipment was not monitored.

WWS: By September 2004 (close of project phase) it will not be possible to undertake two of the twelve cattle shows that were envisaged. It may not be possible to order all the straws of semen because of the current ban on importation of animals and semen.

6. Overview of the dairy sector and what further investments need to be made

An overview of the dairy sector is provided in Section 2 of this report. More donor support is proposed for the dairy sector in Uganda in three key areas (Section 8.2):

- **The East and North**: build on the support provided in 2001-3 in the 10 milk deficit districts
- **The South-West**: in Bushenyi, Kabale, Rugungiri and Kasese in collaboration with PRIME/West
- **National:** milk consumption, export promotion and policy reform

The Central and West regions are a lower priority since it is quite well developed in milk production, processing and marketing, but could also be supported on a demand-driven basis.

7. Verification of consortium activities and results

During field visits the consultants endeavoured to validate the data presented to them by the consortium. This was assisted by the wide coverage in field visits in which almost 200 persons were contacted. They were able to obtain evidence in numerous ways:

- Discussions with micro and macro processors about milk supply, milk quality, production of value-added products
- Discussions with farmers to verify milk yields and income – examination of milk records etc
- Examination of business plans of farmer groups and cooperatives and discussion with group leaders
- Discussions with milk handlers and processors who were trained
- NRM activities on farms
- Discussing insemination records with AI technicians
- Viewing of coolers, biogas units, plant installations etc.

The consultants were satisfied that activities in the field matched the results reported by LOL.

1. INTRODUCTION

Alan King and Associates was engaged by USAID/Uganda to carry out the final evaluation of the Uganda Private Sector Dairy Development Activity (2001-2004) in April-May 2004. The dairy activity was carried out by a consortium consisting of Land O'Lakes (LOL), Heifer Project International (HPI) and World Wide Sires (WWS).

The full Statement of Work is given in Appendix 1. The major requirements for the evaluation were to focus on:

- The extent to which the objectives of the project have been met by the consortium
- Issues arising from project implementation and lessons learned which can guide any future programs
- Project impact on the marketing chain, particularly the effect of consortium efforts on household incomes
- Constraints which appeared during project implementation and methods used to overcome them
- Identification of activities which were in the program but which were not initiated or completed
- Provision of an overview of the dairy sector with recommendations on what further investments need to be made, and where USAID might play a role.

1.1 Evaluation Methodology

The evaluation methodology of consultancy team[1] was:

Review of literature and other materials

A comprehensive review of existing documents was made. Documents and materials were obtained from the consortium, USAID, and others organisations/stakeholders contacted. The literature consulted is shown in Appendix 2.

Meetings with individuals and organisations in Kampala/Entebbe. See Appendix 3 for the full list of persons and organisations met. Those contacted included: consortium staff, consortium clients and other stakeholders such as dairy farmers, producer groups, processors, input supply companies, industry associations and service providers

- Other donors and NGOs in the dairy field, Government of Uganda officials such as Ministry of Agriculture, Animal Industry and Fisheries, Dairy Development Authority, Dairy Corporation
- USAID staff
- Other project initiatives in, or related to, dairy development such as PRIME/West, SCOPE and IDEA

Field Visits

The field visits were extensive and were conducted in northern, eastern, central and western regions. Guidance was obtained from the consortium as to which individuals/groups to visit in the field. The evaluation team modified this with unscheduled visits to ensure impartiality in the selection of those contacted. The team divided into groups and a total of almost 200 persons were personally contacted which provided valuable insights for the evaluation. See Appendix 4 for itineraries of the field visits.

1.2 Goal and purpose of the activity

The goal of the activity was to increase incomes for rural dairy farmers. The purpose of the activity was to increase dairy sector competitiveness and productivity. These were expected to be achieved by adopting a regionally focused implementation strategy with six key areas of intervention:

[1] Consultancy team: 1. Alan King: Evaluation Methods and Subject Analyst (Team Leader); 2. Dr Eddie Mukasa Mugerwa: Dairy Production and Agribusiness Analyst; 3. Arne Mathiassen: Post-harvest Dairy Analyst; 4. Dr Bernard Bashaasha: Agricultural Economist

- **Market development** – increase domestic milk consumption, exports and market linkages (farm to processors and processors to consumers);
- **Processing, marketing and distribution of value-added products** – increase the variety, quality and availability of value-added milk products;
- **Milk bulking and handling** – increase efficiency of milk collection, improve milk quality and reduce milk losses;
- **Production** – increase the availability of milk in milk deficit areas while increasing the productivity of commercial milk producers;
- **Industry organization –** strengthen group-led business development and encourage industry organization around key constraints to greater economic growth;
- **Policy reform** – encourage policy reforms and increase stakeholder participation in industry associations.

At the end of the activity, the consortium expected to have achieved the following results:

- **Increased consumption.** Fourteen million liter increase in annual consumption of processed dairy products after three years.
- **Increased exports.** 30,000 liters per day increase in exports of dairy products after 3 years.
- **Increased productivity in production.** 25 percent increase in average productivity per animal per day of participating farmers at the end of 3 years. 15 percent reduction in average cost of production per liter of milk by participating farmers by the end of year three.
- **Increased productivity in dairy processing.** At least an 7 percent increase in processing plant utilization per year (21% after 3 years). Fifteen percent reduction in processing costs for selected processed dairy products (e.g. pasteurized milk, UHT milk, yogurt, and/or mala).
- **Increased volume of milk entering cold-storage/bulking system**. 60,000 liter per day increase in milk entering cold-storage/bulking system by year three.
- **Enterprise Creation, Employment and Income.** Increase in yearly on-farm household income and increase in employment in the processing, services, and input supply sectors.
- **Increased availability of milk and milk products in the North and East.** At least 10 million liter increase in milk availability in the North and East after 3 years.
- **Increased participation in natural resource management.** 3,000 producers will have adopted at least one natural resource management practice after 3 years
- **Increased use of biogas.** 75 % reduction in use of wood for fuel for households utilising biogas.
- **Increased membership in democratically-run cooperatives, farmer groups and associations.** 25 percent increase in membership per year.

The dairy consortium activity contributes to the new USAID-Uganda Integrated Strategic Plan 2002-2007. By increasing the productivity and competitiveness of targeted farmers, more milk and value-added dairy products will be sold, thereby stimulating demand for farmers' milk. As more milk-based products are sold, increases in rural household incomes, employment and off-farm enterprises will result.

2. OVERVIEW OF THE DAIRY SECTOR IN UGANDA

2.1 Current supplies and projected demand for Milk

People's income influences their protein intake. The combined effect of increasing human population, rural-urban migration and rising social structure and income is stimulating greater demands for foods of animal origin (meat, milk and eggs and their value added products). The Food and Agriculture

Organisation and World Health Organisation of the United Nations recommend *per capita* intakes of 56 kg meat and 200 liters of milk a year. The present average intake in Uganda of 40 liters of milk per head (about twice as high in urban than rural areas) points to a large overall consumption deficit. If a target is set to raise milk consumption to 80 liters per head per year by 2015 and 120 liters by 2050, policies are needed to start raising production to reach 3.2 billion liters a year by 2015 and 7.7 billion liters by 2050. These targets are reasonable, feasible and necessary given the many opportunities to grow the local dairy industry. The targets will nevertheless be hard to attain if production does not expand better than previous averages of 3.2% which is below the present 3.4% human population growth rate.

2.2 Milk production systems in project area

It has been estimated[2] that milk production in Uganda has increased from about 450 million litres in 1995 to over 700 million litres in 2003. Most milk (65%) in Uganda comes from indigenous cattle raised traditionally under pastoral (extensive subsistence), agro-pastoral, or settled mixed crop-livestock farming particularly in the 'cattle corridor'. Because of decreasing access to land, increasing labour demand and level of investment per unit of output, commercial dairying is also growing. The latter farms are often located closer to consumer centers due to the perishable nature of milk, limited access to coolers, and the need to reduce transport costs for inputs and outputs. Better-managed farms (small, medium or large) have paddocks of natural and improved pasture and more farmers are adopting 'zero-grazing' where land is at a premium.

Daily yields vary from 2-5 litres for native cows to 15-25 litres (occasionally higher) in properly managed Friesians (such as in zero grazing units) depending on availability and quality of forage. In addition, farmers may provide home-mixed or farm-grown supplementary fodder and the more successful ones supplement also with concentrates. Owner families consume 1-2 litres, a small amount may be gifted and the rest is marketed.

2.3 Milk processing and marketing

The dairy processing sector has grown to 9 macro-processors for UHT-milk, pasteurised milk, butter, ghee, yoghurt, ice cream and dairy cream, and 49 micro-processors who make yoghurt, cheese, ice cream, dairy cream and ghee. Before the liberalisation of the milk market in 1990 the Dairy Corporation had a monopoly in the trade of processed milk. Now Dairy Corporation is still the biggest processor, but is competing with others. However a competing development is that approximately 50% of the milk sales in Kampala have now been taken over by the informal milk trade which sells loose, raw milk in the streets directly to the consumer.

It has been estimated[3] that of all milk produced, 65% is marketed and 35% stays on the farm for consumption, feeding to calves etc. Of the 65% marketed about 92% is traded through the informal sector (which includes sales to neighbours and nearby villages) and 8% through the formal sector. The great majority of formal sector sales is in the towns with Kampala leading the way with 50% formal sales. Many vendors purchase milk directly from the farmer or cooperative group and sell the raw milk directly to the public. Vendors may purchase milk at a similar price offered by private dairies and cooperatives, but they sell to the public more cheaply than the commercial sector because they do not have the overhead costs of adding value, such as pasteurisation and packaging. Processors pay producers monthly, weekly or bi-weekly. Whichever system is in place, field visits by the evaluation team found numerous instances of milk bulking farmer groups citing delayed payment or non-payment by larger processors after milk had been accepted by them. Many informal vendors offer immediate cash payments for milk which is more

[2] S.J. Staal and W.N. Kauongo,: The Ugandan Dairy Sub-Sector, Targeting Development Opportunities. International Livestock Research Institute (ILRI), 2003

[3] S.J. Staal and W.N. Kauongo, *op. cit.*

attractive to producers. But in times of over supply, and at the end of the day, individual producers may be forced to accept promises of later payment which are sometimes not honoured.

It is reported that small scale vendors often adulterate milk with untreated water. More knowledgeable vendors use lactometers to test their own milk for adulteration with water. Raw milk mixed with untreated water is a serious health risk to the public. Inspection of milk in the informal sector is part of the mandate of the Dairy Development Authority. Some inspection of milk is carried out and milk is occasionally condemned but funding constraints have curtailed the number of inspections which can be made.

Training and advertising campaigns by the consortium and others have increased the public's awareness of the dangers of raw milk. Yet many poor Ugandans consider pasteurised milk to be too expensive. They choose to purchase and then boil raw milk from vendors as they cannot afford the price of packaged milk. It is also common even for pasteurised milk, if purchased, to be boiled before consumption which negates some advantages of pasteurisation. While boiling raw milk makes it safer to drink it also reduces its nutritional value.

Largely because the informal sector dominates the milk market, the capacity utilisation of many processors remains at a low level, often below 40% of installed capacity. The consultants comment later in this report on the means of measuring installed capacity.

Regulations exist in Uganda which prohibit the sale of raw, unprocessed milk but they remain difficult to enforce. The Dairy Development Authority has announced that it intends to ban the sale of raw milk in 2004 and is in the process of sensitising vendors and the public about the need for this change. It intention is to ensure that all milk reaching retail milk coolers is pasteurised.

There are opportunities for the export of UHT milk within the region. With Land O'Lakes support, export surveys were conducted in Tanzania, Rwanda, Burundi, Nigeria Southern Sudan, Ethiopia, Eastern Congo and Kenya which found export potential in some of these countries. It is known, for example, that traders from Southern Sudan and DRC collect UHT milk from Arua in northern Uganda. Assisted by this support, in 2003 Tanzania received 373,000 litres of UHT milk from Uganda, and to May 2004 had received or ordered 230,000 litres. There is potential to expand this. Challenges which need to be overcome include tariff and non-tariff barriers, preparedness to export and more effective use of promotions. From September 2004 milk duty on milk will be zero rated under the new EAC Protocol - which will be an added incentive to exporters.

Although milk production appears to be growing nationally, there are seasonal gaps in supply which largely follow rainfall patterns across the country. Over-production occurs in western and central regions while deficits remain in several regions including the north and east.

2.4. Issues facing the dairy sector

A swot analysis carried out by the consortium highlights the main issues facing the dairy sector:

Table 1: SWOT Analysis of Dairy Sector

Strengths	Weaknesses
• Increasing milk production • Growing market: - Increasing demand for value added dairy products (esp. yogurt and ice cream) - Increasing consumption resulting from population growth and urbanization • Increasing product diversity	• No clear strategic development plan for the sector • Relatively low domestic consumption levels • Lack of reliable industry data • Regulatory and policy reform yet to be fully implemented • Potential impact of policy reforms not well

• Heightened promotional activity by processors
• Increased investment in micro and SME dairy processing
• Exportable long-life products
• Favorable climate: rainfall, pastures
• Government recognition of value of sector
  - Active Dairy Development Authority
  - Policy and regulatory reform
• Improved skills: - farm level, processors
• Spirit of association: farmers, traders, processors
	analyzed
	• Quality standards for the industry yet to be fully enforced
	• Inefficient linkages within value chain
	• Inadequate cooling / collection system – not extensive enough (esp. Central, North and East)
	• Limited producer-processor supply agreements
	• Few bulk transportation options
	• Limited retail cold-storage chain in up-country, peri-urban/rural markets
	• Growing but limited promotions by processors
	• Dairy products not viewed as "refreshment" products by consumers
	• Processed products perceived as high cost
	• Quality packaging not readily available and/or affordable
	• Seasonal and regional variation in milk production
	• Poor animal nutrition
	• Inconsistent availability, affordability and access to extension services
	• Poor investment climate (Interest rates, poor past performance of dairy sector loans, limited outreach to the agricultural sector
	• Newly formed and unproven producer groups and industry associations
	• Improved but limited skills (technical and business): farmer, producer groups, micro-processors and processors
	• Limited demonstration centers / educational centers
	• Lack of knowledge/skills/ information on how to access and utilize finance
	• Low private sector moral

Opportunities	**Threats**

• Introduction of Government policy and regulation
  o Milk quality standards
  o Shift away from raw milk sales to processed milk sales in urban areas
• Strategic Government-led initiatives: Privatization of Dairy Corporation Ltd., Dairy Development Authority, Uganda National Animal Genetics Resource Centre and Data Bank, NAADS, PMA, Export Initiatives, Cooperative Reform
• Export markets: Eastern DRC, Kenya, Rwanda, Tanzania
• Expanding retail cold storage chain
• Globalization: opportunities for new product
	• War / instability
	• Imports
	
	• Low profitability for some processors, especially those underutilizing processing capacity (often poor management
	• Impact of new policies on jobs, profitability, income, investment, and value chain efficiency
	• Competition with liquid beverages (e.g. soda, water, juice)
	• Lack of disposable income
	  o Farmer: for input supplies and extension services
	  o Consumer: for household and personal needs

development and trade access • Excess processing capacity • Availability of Government-owned milk collection centers for lease or sale to dairy farmers • Equity investment (30%) in privatization of Dairy Corporation Ltd. available to farmers • Increasing availability and variety of input supplies and support services (e.g. feeds, equipment, extension services) • Enterprise-linked extension services • Investors: foreign and domestic • Availability of financial services (e.g. Micro finance institutions) • TA and promotions from donors / NGOs / Govt. • Relative political stability (North excluded) • Improve stability of seasonal and regional milk production • Expand research into breeding and production systems strategies • Expand technical assistance/extension service provision: Dry season feeding/storage, Water harvesting, Animal nutrition • Restocking in the North and East • Expand milk bulking/cold storage chain to areas lacking infrastructure	• Competition for disposable income • Dominance of the informal sector o Consumer health concerns o Control of milk supply o Unfair competition for formal sector • Seasonal and regional supply/demand gaps • Consumer preference for fresh milk • Health risks associated with unprocessed milk: tuberculosis, brucellosis, salmonella, listeria, e-coli 137 etc • Animal diseases • Climate changes – longer/less predictable dry season? • Farmers payments: irregular and not for quality

2.5 Economic assessment of the dairy sector linked to consortium activities

Discussions with clients suggested that household incomes and business profitability had increased as a result of support from the dairy consortium activity. This is supported by consortium results, and activities carried out to achieve results (Tables 2 and 3). A recent analysis of consortium activities by Keyser[4] on the impact of project activities since 1995, together with information gathered by the current evaluation team's agricultural economist in May 2004, provides the following information:

Farm level profitability

- 273.6 million liters additional milk has been produced equivalent to about Ush 47.1 to 65.7 billion
- Training activities and support for new bulking groups resulted in Ush 23.8 billion additional net profit from smallholder dairy farmers
- Because of improved production efficiencies the milk was produced for about Ush 6.4 billion less than if using the old technologies before training by the consortium
- The changed production technologies created about 3.77 million days of employment for hired labour while at the same time saving over 160,000 days of family labour

Bulking group profitability

Lol's target of having 60 start-ups of new milk collecting coolers during the three year period was surpassed since by March 2004, 104 new milk collecting coolers had started functioning. This achievement is extremely important since it greatly improves the ability to have the milk cooled to proper holding temperatures for improving shelf-life of the milk.

[4] Keyser, J: Uganda Private Sector Dairy Industry Development Impact Assessment (October 2003)

Several bulking groups were visited by the consultancy team's agricultural economist and accounts were examined. It was found in the western region that volume of milk in litres/day received by the bulking centres/farmer associations had increased by about 285% from an average of 1,384 litres delivered per day three years ago to the current average of 6,233 litres delivered per day today. This is a major achievement. As an example, in section 5.1.5, Figure 1 depicts monthly milk sales for Ntungamo Dairy Farmers Cooperative Union, and Figure 3 the gross margin trends for the same group. These both show healthy trends compared with three years ago. Keyser (op cit) found a similar trend when examining Bushenyi Dairy Industry Cooperative Union, another group supported by LOL. It was found that in only six months a cash balance of Ush 26 million could be achieved with almost Ush 10 profit on each litre of milk. While not all groups were as advanced as the two examples given, there is little doubt that others will be able to achieve similar profitability.

Milk Processing, marketing and distribution of value-added products

The sales of value added dairy products like yoghurt, cheese, dairy cream, and ice cream from the processors, with which the consortium is working, increased from a total of 208,158 kg in 2001 to a total of 710,021 kg in 2003, (see figures below) an increase equivalent to 245% which is an impressive achievement. Several processors visited indicated that they wished to increase capacity for producing dairy products since it was found to be more profitable than pasteurising of milk. Not all of this increase in business can be attributed to LOL alone as there are other variables impinging on the situation, but the trend is encouraging.

		Kg Sales in 2001	**Kg sales in 2003**
1.	Yoghurt	173,531	425,464
2.	Ice cream	33,634	246,482
3.	Cheese	994	30,144
4.	Dairy cream	0	7,961

Overall, the Internal Rate of Return on consortium project spending to 2003 was 19.6% which increases to a very impressive 45% when future project benefits are taken into account.

3. RESULTS ACHIEVED BY CONSORTIUM

The results achieved by the consortium in the six chosen areas of intervention have in general been good. The interventions and activities performed are well known in the dairy industry, and they are much appreciated by clients.

Results are evaluated as follows;

- **Market development** – an increase of 6.5 million liters in consumption of milk and milk products was achieved. From 22 liters/head/year in 1991, LOL contributed to raising milk consumption to a currently-estimated[5] 40 liters/head/year. General awareness in the urban population of milk as a nutritional beverage for drinking and for food has been improved. The ongoing sales of unpasteurised milk in the greater Kampala area continue to be a potential health hazard, which needs some further intervention. Export markets were developed with 3,860 liters/day increase in exports of dairy products. This fell below the target of 14 million liters largely due to business constraints at several major processors and a shortage of packaging material for UHT production.
- **Processing, marketing and distribution of value-added products** – The variety of value added products has increased and the market has expanded rapidly for products like yoghurt and ice cream in competition with imports from Kenya and South Africa. Also domestically produced European

[5] IFPRI: The Uganda Dairy Sub-Sector: Targeting Development Opportunities. June 2003

types of cheeses have gained a market foothold, and so has fresh dairy cream, which is new in the market.

- **Milk bulking and handling** – Improved efficiency in milk collection and improved milk quality has been achieved although this area needs further investments and attention. The achievements are higher than targets. 104 new milk coolers have been commissioned to improve on the cooling chain from farm to consumer. There are still many areas where milk is traded and transported for up to 7-10 hours after milking before it hits the cooling tanks in Kampala.
- **Production** – The milk availability in the east and the north has within the three years increased by 3.6 million litres per year as a result of the Consortium intervention, and small dairy processors are beginning to become established. These are milk deficits areas where a lot more milk needs to be produced for local consumption, and the consortium interventions need to continue.
- **Industry organization –G**roup-led business cooperatives around milk collecting centres have taken over the operations of the milk cooling centres in the southwest and 41 new enterprises have established cooling centres. By March 2004 a total of 124 producer groups/cooperatives and 8 associations had been assisted.
- **Policy reform** – The Consortium has supported policy reform, and has contributed to the ban by DDA on the boiling of milk openly in urban areas, which indeed is a major achievement. Also the Consortium has supported DDA's reforms through which the transport of milk in plastic jerrycans was banned and replaced by the use of metal milk cans. This applies to transport of milk by street vendors to consumers as well as the transport of milk from farms to milk collecting centres and milk cooling centres.

Table 2 below shows the extent to which the stated objectives set out during the planning phase have been met until September 2003. The programme runs until end September 2004, so the achievements not yet reported for the last year of the three-year programme will be added to the achievements reported in this table.

Table 2: Assessment of the extent to which results have met targets set by the Consortium

Target Activity Performance Indicators and *Assumptions at start of project (italics)*	**Results Through September 2003 and *comments (italics)***
Increased Consumption of Processed Milk and other Selected Dairy Products	
14m litres increase in annual consumption of processed dairy products. *Based on sales of processed products = 110,000 liters/day (based on Competitiveness Study + estimate of microprocessors). Assumed 35% increase in sales after three years.*	6.5m. litres known increase in consumption of processed dairy products. *These data do not include Jesa Farm Dairy, which is estimated to have a total sales volume of 1.9m litres per year. Target not met because of business constraints at DCL and GBK, and UHT line at Alpha Dairy not yet installed. Also shortage of packaging materials linked to business constraints*
Increased Exports of Processed Dairy Products	
30,000 litres per day increase in exports of dairy products. Assumed *30,000 liters per day increase in exports of dairy products after 3 years. Assumed four processors had management, financial and product quality ability to meet export market opportunities, were then processing 75,000 liters per day; assumed 40% increase in throughput from exports alone.*	3,860 litres per day increase in exports of UHT-milk *Constrained by the business and packaging constraints provided above. Other contributory factors: Decrease in 2002 due to import levies to Kenya. Increase in 2003 due to co-packing agreements with Tanzania and Rwanda.*
Increased Availability of Milk and Milk Products in the North and East	
At least 10m litres increase in milk availability in the North and East. *Participating commercial*	11.6m litres increase in milk availability in the North and East calculated as result of the intervention.

farmers increase average production per animal per day from 8 liters to 10 liters.	*Target was met*
Increased Productivity in Milk Production	
25% increase in average productivity per animal per day of participating farmers.	25% increase in average productivity per animal per day of participating farmers.
15% reduction in cost of production per litre of milk by participating farmers. *Based on best estimate.*	• 49% reduction in cost of production per litre of milk by participating farmers. *Increased efficiencies gained through training and adoption of NRM practices*
Increased Productivity in Dairy Processing	
21% increase in overall formal sector processing plant utilization. *Based on processing volume of 110,000 liters/day with installed capacity of 315,000 liters per day. Increase in consumption from processing in formal sector plants would be 36,000 liters/day and an increase in processing for exports of 30,000 liters/day. This would produce a 60% increase in throughput (66,000/110,000) after three years and a 21% increase in overall capacity utilization (66,000/315,000)*	31% increase in processing capacity utilisation reported, based upon the same computation of installed capacity as originally used.
Increased volume of Milk Entering Cold Storage/Bulking System	
60,000 litre per day increase in milk entering cold storage/bulking system. *Estimated Ush60/litre saved by developing farmer cooperatives/bulking groups*	75,520 litres per day increase in milk bulking/cold storage.
Enterprise Creation, Employment and Income	
New enterprises created in the dairy sector. *Difficult to estimate precise numbers before project start*	59 new enterprises (post-production) created in the dairy sector, 41 of them are milk collection centres, 11 artificial insemination centres.
Increase in employment in the Processing/services/input supply sector. *As above*	373 new jobs created in dairy sector (post-production).
Increase in yearly on-farm household income from dairying. *Measured by farm level milk production and sales*	$349 average increase in household income for participating farmers.
Increased Participation in Natural Resource Management	
3,000 farmers adopting at least one natural resource management practice. *Assumptions were: 100 producers using biogas systems;1,220 producers practising zero-grazing; 1,000 producers adopting pasture management techniques; 1,000 producers adopting soil and water conservation techniques*	6,912 farmers (4,135 females and 2,777 males) adopted zero grazing techniques. • 6,433 farmers (3,183 females and 2,620 males) adopted improved pasture management techniques. • 5,001 participating farmers (3,001females and 2,000 males) adopted soil and water conservation techniques. • 309,490 multipurpose trees planted by participating farmers. • 88 biogas units constructed and all in use. *Numbers difficult to calculate at start of project. Numbers are not additive since farmers taught several techniques in groups*
75% reduction in use of wood fuel for households utilizing biogas. *An illustrative target only*	70% reduction in use of wood fuel for households utilizing biogas. *Measured by number of trees cut and quantities of firewood purchased*
Increased Membership in Democratically-run Coops, Farmers' Groups and Stakeholder Associations	
75% increase in active membership to democratically-run coops, farmers groups and associations. *Based on membership levels at the time*	89% increase in active membership to democratically-run coops, farmers groups and associations.

Other Indicators - Increased Competitiveness of Dairy Enterprises	
Increase competitiveness of dairy enterprises.	• 79 coop/association leaders (8 females and 71 males) trained in management skills.
	• 10 bankable business plans developed and 3 revised for various producer groups/ microprocessors.
Other Indicators – Increased Productivity of Agricultural Commodities (Milk)	
At least 5,000 conceptions registered.	• 12,805 doses of semen sold; 64% conception rate.
Other indicators - Environmental and PERSUAP Compliance	
Environment Impact Assessments conducted for new (or expansion) processing plant and milk collection canters.	• 4 Environment Impact Assessments conducted for new (or expansion) processing plant and milk collection centres.
Ensure that in-calf heifer scheme subsistence farmers' dietary needs are met..	• 420 farmers (222 females and 198 males) trained in human nutrition and farm planning
Ensure safe pesticides use.	• 485 extension agents and farmers (238 females and 247 males) trained in IPM practices
	• 397 farmers (206 females and 191 males) adopting IPM practices
	• 677 extension agents, farmers and distributors (380 females and 297 males) trained in safe acaricide application and use
	• 349 extension agents and farmers (158 females and 191 males) adopting safe acaricide application practices
Biogas appliance fabrication plant.	• Workshop manual for biogas appliances production prepared and being implemented
Biogas construction and operation.	• 394 farmers (214 females and 180 males) trained in slurry management
Other indicators – Cross-cutting Issues	
Health: At least 150 co-training sessions with HIV/AIDS and/or health agencies.	• 114 co-training sessions with HIV/AIDS and/or health agencies. Attendees included 1,341 females and 1,163 males. • HP health scheme covered 3 cooperatives and 443 persons • HIV/AIDS testing, counselling and treatment program for LOL staff • Participation in interministerial school feeding & school milk program *Collaboration with MOST program (USAID): options for vitamin A fortification of milk. MOST funded consortium staff member to attend product fortification workshop in Morocco*

3.1 Verification of results by consultants

During field visits the consultants endeavoured to validate the data presented to them by the consortium. This was assisted by the wide coverage in field visits in which almost 200 persons were contacted. They were able to obtain evidence in numerous ways:

- Discussions with micro and macro processors about milk supply, milk quality
- Discussions with farmers to verify milk yields and income – examination of milk records etc
- Examination of business plans of farmer groups and cooperatives and discussion with group leaders
- Discussions with milk handlers and processors who were trained
- Seeing seeing NRM activities on farms
- Discussing insemination records with AI technicians
- Viewing of coolers, biogas units, plant installations etc.

The consultants were satisfied that activities in the field matched the results reported by LOL.

4. EFFECTIVENESS OF ACTIVITIES UNDERTAKEN TO ACHIEVE RESULTS

4.1. Consortium response to 2000 evaluation

An evaluation by Development Alternatives, Inc. in 2000 made recommendations on activities and procedures for the current phase. The present evaluation team found that the consortium has addressed most of these issues. The main exception is that farm data have still not been analysed in detail and therefore farmers are not receiving the feedback which they have been expecting and which they deserve for their industrious record keeping which was evident on all farms visited. This generally positive response to the 2000 evaluation has been an important contribution to the effectiveness of the current phase and is evidence of the importance of M&E in the project cycle.

4.2 Market development

4.2.1 Domestic market

The development in the domestic market for milk and dairy products has been influenced by the intervention by the consortium in several areas:

- The sales of processed milk from the milk processors, which the consortium has been dealing with, has grown over a two-year period by 6.5 million litres from 17.3 million litres in 2001 to 23.8 million litres in 2003 or a total of 38% increase. This coincides with a reported increase in utilisation of installed capacity in the dairy plants of 31 % by September 2003. This does not include the sales from Jesa Dairy Farm Ltd., which has not reported figures to the consortium although they are a rather visible player in the formal market for pasteurised milk in Kampala. Dr. Florence Kasirya in her report on *Post Harvest Milk Losses – Rapid Appraisal Report* indicates Jesa farm sales to be 1.9 million litres per year.
- During the same period the sales has shifted more towards pasteurised milk as opposed to UHT-milk reported by the processors the consortium has been working with. Pasteurised milk has increased from 9.9 million litres in 2001 to 17.3 million litres in 2003 or an increase in sales by 7.4 million litres or 74%, whereas the sales of UHT-milk has decreased from 7.1 million litres in 2001 to 5.7 million litres in 2003, a drop in sales of 1.4 million litres or 19%. This decline in sales of UHT-milk has solely been experienced in 2003 since there was a slight increase in sales in 2002. Original project projections assumed higher sales figures for GBK and DCL. Both companies experienced business constraints, including the removal of a packaging line at GBK, which resulted in lower than expected sales. Alpha Dairy also experienced delay in installing its UHT line. The reported increased sales of pasteurised milk was, however, verbally questioned by Dairy Corporation Ltd. though no evidence was provided to support this statement.
- It is interesting to note, that during the same period, the quantity of UHT-milk, which has been exported has increased from 0.97 million litres of UHT-milk in 2001 to 2.36 million litres in 2003. This increase in export of UHT-milk of 1.41 million litres per year is almost the same quantity as the drop of 1.4 million litres in sales of UHT-milk on the domestic market.
- Evidence indicates that the functional capacity for manufacturing of UHT-milk installed in the processing plants has gone down during the years 2003-2004 due to problems encountered by the processor G.B.K. Dairy Products (U) Ltd. in Mbarara (as noted above) and the delayed installation of a UHT line in Alpha Dairy
- Retailers in Kampala indicate, that there is an under-supply of UHT-milk in Kampala. It can therefore be assumed that the market for UHT-milk at present is higher than the present supply.
- As well as the change in availability, the shift from UHT-milk to pasteurised milk may also be attributed to the fact, that the milk market to a large extent is price driven, and therefore consumers prefer the cheaper option of the two when it becomes available. One litre of pasteurised milk sells at 800 USH and one litre of UHT-milk sells at 1,500 USH.
- The various promotion campaigns for milk carried out by LOL have been useful and effective. Retailers and processors alike indicate, that the campaigns have helped much in increasing the

awareness of milk as a nutritious beverage, and that they have contributed to the increase in sales of milk and dairy products. As a result of exposure by LOL, Paramount Cheese conducted point of sale promotions and Jesa Dairy advertised through a Road Show.

- Table 3 - Activity results, shows the large amounts of consumer research which has been carried out to support the design of and the monitoring of the Milk Promotion Campaigns and the Media Advertisements carried out.
- The report written for the Consortium on the Advertising Effectiveness of the Radio & Print Campaigns by Steadman Research Services from December 2003 shows that 54% of the interviewees are influenced by the campaign, and that of these 54% there are 68% who actually increased their milk purchases.
- It must be assumed that the Radio & Print Campaigns and the Milk Promotion Campaigns do not only support the sales of the processed milk, but equally support sales of unprocessed milk sold through the informal milk market. Therefore the increase in total milk sales is surely much higher than the increase in sales of pasteurised milk alone, since the sales of pasteurised milk only cater for approximately 50% of the total sales of milk in Kampala. The rest is sold in the informal market from the milk coolers through the milk vendors and other outlets for raw milk to the consumers at lower prices than the price for pasteurised and packed milk.
- On the national level the sales of milk sold through the informal market is in several reports quoted to be about 92 % of all milk sold, so only 8 % of the milk is sold as processed milk through the formal milk market chains, the bulk of it in the greater Kampala area. The report by ILRI *"The Ugandan Dairy Sector Targeting Development opportunities"* from 2003 claims, that the ratio of 92 % informal to 8 % formal markets seems not to have changed since 1995. This would indicate that the sales through the informal sector have grown proportionally to the increase in the sales of processed milk through the formal sector.
- The expansion of the milk market has also given rise to 314 new sales outlets for milk.
- The marketing and the market interventions carried out by the Consortium appear to have contributed to expanding the market for milk as a whole, and also contributed to diverting the sales towards pasteurised milk.

4.2.2 Export market

- The Consortium has performed 8 export surveys in Ethiopia, Nigeria, Western Kenya, Rwanda, Eastern Democratic Republic of Congo, Tanzania, Southern Sudan, and Burundi. It also led the development of a national export development strategy. These initiatives have provided the basis for increasing the export market.
- Export of UHT-milk was in 2001 0.97 million litres, in 2002 0.51 million litres, and in 2003 2.36 million litres. The decline in exports of UHT-milk in 2002 was attributed to the halting of exports to Western Kenya due to new high tariffs on milk imports into Kenya imposed after a flush of cheap milk powder form Europe was imported by Kenyan milk processors to the detriment of the Kenyan milk producers.
- The increase of exports of UHT-milk in 2003 was attributed to a co-packaging agreement between Dairy Corporation Ltd. in Kampala and Royal Dairies Ltd. in Dar Es Salaam, Tanzania, and an existing co-packaging agreement between Dairy Corporation Ltd. in Kampala and Nyabisindu National Dairy Corporation in Kigali, Rwanda. The agreement with Royal Dairies in Tanzania was a major accomplishment to which LOL made a significant contribution, and it appears set to expand further.
- The development of export markets has been successful to a limited degree. The targets set out by the Consortium are far from being met, and it is not likely that they will be met in the foreseeable future. At the time of project preparation it was not known that UHT production would be constrained by the factors stated in section 4.2.1. Export sales and marketing efforts by the processors are limited. Exports of UHT-milk from one macro processor have increased significantly, but simultaneously

exports of UHT-milk from another macro processor have decreased due to internal problems in the company. At the same time Alpha Dairies Ltd. in Mbarara has reasonable export orders for butter and ghee for Kenya, which they cannot fulfil due to lack of availability of cream. This is supported by statements made by retailers in Kampala that butter is in short supply, and they could sell more.

4.2.3 Future export strategy

The consortium's interventions in exports of milk and milk products have had only moderate overall effectiveness in terms of increase in overall export quantities. This is largely explained by lower than expected performance by several large processors including DCL, GBK and Alpha Dairies. A lack of packaging capacity for UHT-milk and lack of funding for procurements of sufficient packaging materials seem to have been contributory causes. There have been exceptions to this: LOL worked with DCL to establish a market for long life milk in Dar es Salaam, Tanzania, and exports to Rwanda are also developing well:

Exports of UHT milk (litres) from DCL to Tanzania and Rwanda

	2003	2004 (To May)
Tanzania	373,000	230,000
Rwanda	198,000	131,000

A leading Ugandan processor expects to send a consignment of 30,000 litres of long-life milk to Burundi in 2004. Although exports to Kenya were constrained by tariff barriers in 2002 these are technically lifted with the advent of the East African Community. The Kenyan market is controlled by efficient large-scale companies like SpinKnit Dairies and Brookside Dairies which are based in Kenya. However they do not operate to such a large extent in Western Kenya where opportunities may exist to market Uganda milk.

To address the issue of increasing exports the consultants consider that Ugandan processors should be assisted by LOL according to their individual needs. **DCL** would benefit from privatisation and could cost-share with the Global Development Alliance to bring on board an experienced export manager. For **Alpha Dairy** a long life milk line will soon be installed and a high class marketing manager is required which also could be cost-shared with GDA. The new plant at Apha Dairy is expected to have a maximum throughput of 30-50,000 litres per day. Businesses like Gouda Gold, Snowmans and Jesa Dairy require assistance with business and marketing strategies. There are also likely to be increasing opportunities in Sudan if the peace negotiations are finalised. It is known that traders from Sudan and northern DRC collect UHT milk in Arua, northern Uganda, and transport them back to their countries.

Collaboration of LOL with SCOPE project is recommended to develop a cluster of 4-5 processors and to provide assistance with export business marketing strategies. The RATES project should also be engaged to assist with policy issues, tariff constraints and trade contacts.

4.3 Processing, marketing and distribution of value added products

- The sales of value added dairy products like yoghurt, cheese, dairy cream, and ice cream from the processors, which the consortium are working with, has increased from a total of 208,158 kg in 2001 to a total of 710,021 kg in 2003, an increase equivalent to 245%.

	Kg Sales in 2001	**Kg sales in 2003**
1. Yoghurt	173,531	425,464
2. Ice cream	33,634	246,482
3. Cheese	994	30,144
4. Dairy cream	0	7,961

- The quantities of sales of butter have not been reported, but retailers explain, that their sales of butter have increased a lot over the past two years. They report a general short supply of butter over the past few months. During the same two-year period the sales of ghee by the processors, which the consortium works with, has dropped to only 50% of the sales in 2001. It appears, that there has not been sufficient butterfat available to supply the butter and ghee markets. This may also reflect the difficulties experienced by DCL and GBK referred to earlier.
- Retailers report expectations of a steady expansion of the market for yoghurt, cheese, ice cream, dairy cream, and butter in the coming years. They report high retail margins on these products making them very attractive products with a mark-up of 25-40%.
- Retailers as well as market surveys carried out for the consortium indicate, that the value added dairy products are primarily being sold in the greater Kampala area, and that it is the expatriate community, the tourists, and the well-to-do Ugandans who buy them. They seem to be too expensive to purchase for the ordinary Ugandan population. One exception is yoghurt packed in cheap packing like thin plastic pouches which reaches some less affluent people in Kampala, Jinja, Mbale and Mbarara.
- The number of new or improved products, which has been developed and brought into the market during the period from October 2001 to March 2004, is seventy. Through support to the processors the consortium has been involved with all of the new and improved products from which all seventy are still on the market. A new product is defined as any new or improved product from a processor brought to market and sold.
- There are now 49 micro dairy processors and nine macro dairy processors to which the consortium has given support during the past year. 34 dairy processors make yoghurt, 10 dairy processors make ice cream, 5 dairy processors make cheese, and 9 dairy processors make pasteurised milk.
- Dairy processors told the consultants that assistance from the Consortium in terms of consultative advice, symposia, work-shops, consultancies, and promotion campaigns were very much appreciated by the processors who found all activities very effective.
- One of the targets set out by the Consortium was to increase the utilisation of installed capacity in the processing plants in the overall formal sector by 21%. Based on the same baseline computation the utilisation of installed capacity in the processing plants was increased by 31 % after the two years to September 2003.

4.4 Milk bulking and handling

- The target set to increase quantity of milk entering into the cold storage bulking system by 60,000 litres per day was already superseded in September 2003 since by then as much as 75,520 litres more milk was entering the cold storage bulking system each day from the clients, which the consortium has been working with.
- The target of having 60 start ups of new milk collecting coolers during the three year period was superseded, since by March 2004, 104 new milk collecting coolers had been started up. This achievement is extremely important since it improves the ability to have the milk cooled to proper holding temperatures for improving shelf-life of the milk significantly. The objective must be to get the cooling facilities established as close to the farmers as possible to be able to cool the milk as soon as possible after milking. There is still a lot more to be done in this area. From some areas the milk does not reach a cooling station until two o'clock in the afternoon, which is 7 – 8 hours after milking without cooling. The risk of the milk turning bad is extremely high and when it does the producers are not paid at all and the milk is lost to the market. Some of it goes back to the farmers but most of it is just poured away. The activities by the Consortium in this area are thus very important and have shown to be very successful. The intervention includes, establishing of producer groups, linking to credit facilities, training in the operation of the milk collecting centres inclusive of quality testing and business plan development, training in hygienic practices during milking and milk handling, and linking the producer groups to processors for the marketing of their milk. Other buyers would be milk

traders in the informal milk market chain shown above. Further economic aspects of project impact on milk bulking are given in section 5.1.5.

- During the intervention a total of 59 new enterprises (post production) have been established of which 41 have been milk collection centres.
- Although the Consortium has performed 70 milk handling training sessions or seminars and 30 follow-up milk handling training sessions or seminars, field visits indicated that there is still at a need for training of farmers, milk handlers, and traders in hygienic practices in milk handling. Milk collection centres requested training in improving milk quality when received at their centres.
- When testing the milk received at collecting centres, the main defects found was reported in the Baseline Survey Report performed in 2002 for Land O'Lakes by The Ssemwanga Centre to be adulteration, boiled milk, contamination with antibiotics, dirty milk, smelly milk, sour milk, milk with blood and clots, and colostrum milk. Further training in proper hygienic milking and milk handling would help to reduce such problems and improve the food safety issues through the milk marketing chains.
- Due to above mentioned quality problems a lot of milk is lost in the milk marketing chains, which could have been avoided. Dr. Florence Kasirye reports that of all milk produced 35 % remains on the farm from which 20 % is consumed by the family, 7 % by calves, 2 % by other animals on the farms, and 6 % is wasted on the farm. This amounts to 52 million litres per year wasted on the farms. In certain remote areas milk traders do not collect the milk every day or not at all. In such areas another 42 % is wasted on the farms due to lack of buyers.
- Dr. Kasirye reports[6] overall milk losses along the marketing chain to be 11 % due to spillage and another 10 % due to milk spoilage. Adding the 6 % lost at farm level 27 % of all milk produced is lost. Losses during the wet seasons were estimated to double to 22 % along the market chain and more than double at the farm level.
- Also milk is being adulterated by adding sodium bicarbonate to increase the ph-value so that the milk protein will not coagulate when pasteurising or boiling it. But such milk has already gone bad and is unfit for human consumption and could under certain circumstances contain toxic residues from bacterial growth before processing. Analysis has shown that sodium bicarbonate often is added to a level of 500 times the maximum level allowed in foods for human consumption (Dr. Nathan Twinamasiko, DDA, personal communication)
- Adulteration of milk by adding water is also widely practised by traders in the informal milk market it is clamed by MCC staff and by farmers. This undermines marketing activities and increases mistrust in consumers' perception of milk as a healthy food product.
- Dairy farmers in the western region complain about not having sufficient market access for their milk especially during the flush seasons. At the same time Dairy Corporation Ltd. claims, that during the dry season they are not able to attract sufficient milk to supply their sales outlets.

4.5 Production

4.5.1 Eastern and northern regions

The potential for higher milk production, and therefore improvement in rural household incomes, in the ten 'milk deficit' districts of eastern and northern Uganda, has been enhanced by the consortium in a number of ways, including:

- Distribution of 910 in-calf heifers is estimated to have increased regional milk availability by 2.75 million liters within the three years of the project. Over ten years, regional milk availability will annually rise from 0.8 million liters in year one to 39 million in year ten.
- As farmers become more established their management abilities will improve, the herds will grow, as will individual animal production levels. Cost of production and overall farm management costs will

[6] Dr F. Kasiriye: Post Harvest Milk Losses in the Small Scale Dairy Sector – Uganda: A Rapid Appraisal (FAO)

decline (in-house estimates put this at 49%), as more milk will be produced without a corresponding rise in cost. The higher income from dairying will enable farmers to spend more on items necessary for better livelihood. Some have constructed biogas plants while older recipients have put up better houses and diversified into other income generating activities like poultry, rabbit and pig production, and cash crops like vanilla, coffee, and fruits.

- Because of the perishable and bulky nature of milk together with a common lack of coolers, commercial dairying is often concentrated in areas close to urban centers serviced by efficient collection systems. The areas where the project's producer groups are located are becoming heavily populated and land is at a premium. The integrated dairy cattle-crop livestock system (zero grazing) propagated by the Consortium is an efficient approach to sustainable agriculture and land utilization for needy farmers. Thus to a large degree the project engenders sustainable rural-urban links.
- The milking ability of dairy animals is half inherited from the sire hence the clear advantage that through AI, project farmers are accessing the best genetics available. Their challenge is to provide the best management for progeny to perform maximally and the genetic quality of animals will grow. From the production data being recorded on farm it should be possible to gauge the impact of foreign genetics after five years when progeny born will come in production. In the meantime it has been observed that participating commercial farmers increase average production per animal per day from 8 liters to 10 liters, i.e., by 25 percent.
- Even assuming 1-2 inseminations per conception the number of semen straws needed to service the project cattle is much lower than the 52,500 doses HPI (7,500 doses) and WWS (45,000 doses) expect to import. Moreover, all new heifers are distributed as in-calf. Consequently, much of what is imported is available for use elsewhere and will be a significant source of genetics to enhance the genetic improvement of the national dairy herd.
- The advantages accruing from cow manure stimulates the farmer's participation in natural resource management and sustainable agriculture practices. The manure is recycled as fertilizers on crops and pastures. The nutritive value of animal feeds is improved by planting legumes, fodder trees and shrubs, and improved grass species. Soil and water management techniques are applied. Over the three years more than 9,000 farmers have been trained in these techniques. 6,433 farmers (71%) adopted the pasture management and 5,001 (55%) the soil and water conservation methods. In addition 300,000 multi-purpose trees have been planted, and having a 'kitchen garden' is a source of added nutrition.
- Finally, although the construction cost of biogas is expensive, its advantages have been well demonstrated. To-date 88 plants have been built and are in use. Five regional biogas technicians have been trained to meet the technical demand. The system reduces use of fuel wood by up to 70% and slurry produced is useful fertilizer that can increase income from maize production by Ush 55,000 per hectare[7].

4.5.2 Western and central regions

A selection of some of the indicators identified by the baseline report (Ssemwanga Centre, 2002) are adopted and their magnitudes are then compared with the current situation. Table 4 compares the magnitudes of selected indicators. Many of these indicators apply to the western and central regions where LOL interventions have been concentrated.

[7] T. Muramira: Extended Benefit-Cost Analysis of the Biogas Production and Use Program. HPI 2001

Table 3: Selected indicators of impact at dairy farmer level

Indicator	Baseline	Review
Mean number of milking cows per farm	4	6
Mean milk production per animal/per day	7	8
Price of milk/litre	200	200
Mean amount of milk sold per day (litres)	16	25
Fees paid for AI (Ushs/insemination)	14,158	20,500
% of farmers who are members of a cooperative group	67	75
% of farmers making hay / silage	1	20
Farmer Revenue from milk sales (Ushs/week)	30,000	50,000

These data indicate that there has not been a marked increase in the number of milking cows per farm and milk productivity. The increase by 2 of the average number of milking cows per farm may however, signal enhanced interest in dairy production among the consortium partners. The price of milk per litre seems not to have changed. The price of Ushs 200/litre today may actually be less in real terms as compared to three years ago. However the amount of milk sold per day appears to have increased by about 36%, which is very encouraging. There also has not been much change in the proportion of milk sold through the formal market channels. The percentage of farmers in the catchment area who are members of the cooperative group has apparently increased by 8 percentage points from 67% three years ago to 75% today.

Farmer revenue from milk sales per week is said to have increased by about 40 % from Ushs 30,000 to about Ushs 50,000 per week. Since the price of milk has not increased, the increase in revenue must be attributable to increases in milk sales noted above.

Training activities and support to farmer milk bulking groups have certainly increased profitability at farm level by lowering production costs, streamlining milk processing or both. For paddock production system (12 cows), Keyser (2003) reported an annual increment in milk production of 16,080 litres by farmers moving from a typical to an improved production system. For the open range system (20 cows) prevalent in the eastern and northern parts of Uganda, the estimated annual increase in milk production was 3,950 litres by farmers shifting from a typical production system to an improved livestock production system.

The Keyser (2003) study also computed, for the paddock production system, increments in annual net profits to the tune of USD636 or Ush1,227,500 by moving from a typical to an improved livestock production system. The annual net profit increment computed for the open range system was USD104 or Ush200,720 derived by shifting from a typical to an improved grazing system. Although these data could not be fully verified in the field, they appear to be fairly realistic and may well represent the impact of improving livestock management systems.

Field assessment indicated that the majority of farmers are indeed changing their livestock management systems from typical to improved. Under the paddock system, 3915 or 45% of the 8700 assisted were reported to have changed from typical to improved grazing system. The number was 1120 or 35% of the 3200 farmers assisted under the open grazing system.

The other benefits noted and highlighted by farmers include

- A conscious effort to improve their herds by introducing cross breeds (WWS)
- Increased appreciation of milk as a reliable source of household income, etc

- Enhanced cleanliness entailing: washing hands, before and periodically during milking, cleanliness of milking area
- Conscious effort not to adulterate milk with colostrum, not adding water and not adding milk of the previous day.
- Enhanced stability of milk revenue.
- Decline in non payment of debts.

Attendance at farmer seminars was reported to be about 75% of members. A spill-over benefit is that farmers reported to be increasingly sharing their knowledge with their neighbours – this needs to be nurtured and fostered.

Local leaders noted the following additional benefits:

- An increase in milk consumption at household level and subsequent reductions in the incidence of diseases such as kwashiorkor.
- Increased household incomes and a reduction in poverty for some households. However, farmers were more guarded regarding improved nutrition and reduction in poverty levels linked to consortium interventions. Nevertheless, farmers did acknowledge an improvement in their well being and were unanimous that household milk consumption levels have at least not declined since consortium interventions. We could not independently and empirically derive an estimate of the impact of the consortium interventions on household nutrition status and on poverty. What is clear though is that income from milk sales has increased as earlier noted.

4.6 Industry organisation

- During the first two years of the Consortium interventions 59 new enterprises were established in the dairy sector (post harvest), and 373 new jobs created. 41 of the new enterprises were farmers cooperatives, from which some took over the responsibility for operation of the milk cooling and collection centres and then leased the milk cooling tanks form the Dairy Corporation Ltd. which had until then been the operator of the collecting centres. This way the responsibility for the milk collection and milk quality has been transferred to the milk producer's own cooperatives. All parties alike express this to be a more satisfactory arrangement than before, when the Dairy Corporation Ltd. had the responsibility. It has also improved on the payment to farmers, who are now paid almost on a regular basis every two weeks. The impact of these initiatives is reflected in $349 average increase in household incomes for participating farmers.
- During the same period of time the membership in democratically run Cooperatives,
- Farmers' Groups, and Stakeholder Associations have increased by 89 %.
- New associations were also launched namely Uganda National Dairy Farmers Association, Eastern Dairy Farmers Association and Uganda Dairy Processors Association. These establishments will over time contribute to the empowerment of the dairy farmers and of the dairy processors. They will also increase participation in discussions on policy reform.

4.7 Policy reform

- During the period of intervention the Consortium has participated and contributed in a positive and constructive way to the debates on the policy reform processes, which have taken place in the dairy sector. Collaborative contacts have include Dairy Development Authority, Uganda National Bureau of Standards, Ministry of Health, Ministry of Agriculture, Animal Industries and Fisheries, Ministry of Education and Sports, Ministry of Finance, Planning & Economic Development, French Embassy, Uganda Export Promotion Board, Uganda Dairy Processors Association, Uganda National Dairy Farmers Association, Western Uganda Dairy Farmers Association.
- The areas of debate have been: school milk programmes, milk quality standards, national export development strategy, privatisation of Dairy Corporation ltd., milk boiling in urban areas, correct containers for transporting milk. As a result, during the period of the consortium intervention the

transporting of milk in plastic jerrycans, and the boiling of milk openly in the urban areas in Kampala, have been banned. Plans for privatisation of Dairy Corporation Ltd. are progressing, and dairy inspectors under DDA have been trained.

- Together with the Dairy Development Authority the Consortium has trained 6 Dairy Inspectors and Monitors.
- Four discussion documents (White Papers) have been produced by the consortium: 1)Working Document for the Proposed Reform of Containers used to carry Milk in the Dairy Industry, 2) Discussion Document for the Consumer Milk Supply in Kampala, 3) Preservation of Raw Milk by use of the Lactoperoxidase System, and 4) Seal of Quality Programme.
- Many Consortium partners in the dairy industry told the evaluation team that the inputs by the Consortium to the above-mentioned debates and processes have been very valid and have contributed well to the reform processes.

5 CONTRIBUTION OF EACH CONSORTIUM MEMBER TO ACHIEVEMENTS

5.1 Land O'Lakes

5.1.1 Activities

The activities under each intervention from the start of the programme through March 2004, which were performed by Land O'Lakes are shown in table 3: It is these activity achievements which have led to the performance results shown in table 2. The number of activities under each intervention is shown. As can be seen, the number of activities performed has been quite high. It should be noted that the number of farmers listed in the table are not additive and that some farmers were trained in more than one activity

Table 4: Land O'Lakes Activity Achievements

Intervention	Activity	Achievements through March 2004
Market Development	Consumer Research	• Milk and milk products Usage & Attitude (U&A) Study conducted. • U&A results disseminated to producer groups, processors and other stakeholders during seminars, workshops, trainings and meetings. • Retail trade audit and revised U&A (including demographic research analysis) carried out. • Retail cheese audit carried out • Ongoing integration of research results into processors' business and marketing plans
	Milk Promotion Campaigns	• 76 road shows conducted. • 17 dairy days conducted. • 330 experiential marketing events conducted. • 200 in-school promotions conducted • 819 merchandizing events conducted.

	Media	• 11 radio ads developed. • 1444 ad placements on 7 local FM stations. • 360 generic product mentions run on 6 FM stations • 61 Announcement Ads & 40 Event mentions run on local FM radio stations • 9 Talk Shows on 5 radio stations • 7 Print ads with 40 placements. • 2 Charity-Hops • 2 Q&A interviews • Estimated 4,227,500 listeners and 369,600 readers reached.
	Local Market Expansion	• 314 new sales outlets developed
	Develop and expand export market	• 8 Export surveys carried out in Ethiopia, Nigeria, Western Kenya, Rwanda, Eastern Democratic Republic of Congo, Tanzania, Southern Sudan and Burundi. • Export symposium held. • DCL-Royal Dairies co-packaging deal for exports to Tanzania. • On-going support to processors to capitalize on export business opportunities • On-going follow-ups to country-specific export assessments.
Processing, marketing and distribution of value-added products	New Product Development	• 29 new value-added products developed.
	Quality-led and efficient processing	• 58 processors assisted. • 11 microprocessors workshops conducted.
	Product marketing and distribution	• 324 consultancies and trainings offered. • 76 follow-up consultancies and trainings offered.
	Planning and financing	• 184 consultancies and trainings offered. • 53 follow-up consultancies and trainings offered. • 8 business plans developed by producer/bulking groups
Milk Handling and Bulking	Market linkages	• 50 partnership meetings and follow-ups held. • 6 milk supply contractual agreements signed between DCL (processor) and producer groups in Western Uganda.
	Milk collection centers	• 104 milk collection centers start-ups. • 75,520 liters/day increase in milk going through cold chain
	Links to financing	• 20 linkages developed between financing institutions and producer groups and/or milk collection centers. • 7 producer groups operating self-financing schemes.
	Milk handling	• 70 milk handling training sessions or seminars conducted. • 30 follow-up milk handling training sessions or seminars conducted.
Industry Organization	Dairy producer groups and cooperatives assistance	• 124 producer groups/cooperatives assisted.
	Industry associations assistance	• 8 associations assisted.

Policy Reform	Steering Committee meetings	• 5 consortium steering committee meeting held
	Policy-related forums	• 7 policy-related forums held.
	Policy concept/white papers	• 4 concept papers developed
	• Collaboration	• School Milk Program • Training of dairy inspectors • Examples of milk quality standards developed • National Export Development Strategy • Dairy Development Authority • Uganda National Bureau of Standards • Uganda Export Promotion Board • Uganda Dairy Processors Association • Privatization of Dairy Corporation Limited • Privatization Unit • French Embassy • Uganda National Dairy Farmers Association • Western Uganda Dairy Farmers Assoc. • School Feeding Program • Ministry of Health • Ministry of Education & Sports • Ministry of Agriculture, Animal Industry & Fisheries • Ministry of Finance, Planning & Economic Development

5.1.2 Achievements

The results achieved by LOL through September 2003 are shown in Table 2, and the activities which led to the result are shown in Table 3. Bearing in mind that results are shown after only 2 years of the three year program, a number of the targets for the three years intervention had already been superseded after two years in the areas of interventions by Land O'Lakes Inc. The major achievements were:

- 55.3 million liters of milk produced by participating farmers
- $349 average increase in household income for participating farmers
- 7.1 million liter increase in availability of milk in the north and east
- 910 in-calf heifers distributed in the north and east. By September 2003 this will increase to 1013 since more will be purchased due to exchange rate changes
- 6.5 million liter increase in consumption of processed dairy products
- 3,860 liters/day increase in exports
- 89% increase in active membership of producer groups, cooperatives and associations
- 373 new jobs developed post-production in the dairy sector
- 59 new post-production enterprises developed
- Over 12,000 farmers trained in production and NRM practices
- 12,805 straws of semen sold and used at 64% conception rate
- 14-17% increase in utilisation of processing capacity
- 75,520 litres per day increase in milk bulking
- 88 biogas units installed and all being used

These are impressive achievements. More impressive still are the results of an impact assessment of the LOL consortium initiatives since 1995[8]. It showed an Internal Rate of Return of 19.6%. When future project benefits were included the IRR jumped to a very impressive 45%.

[8] Keyser, J. (op cit)

5.1.3 Constraints

Serious constraints in relation to the interventions and activities were not felt by Land O'Lakes. But it has been noted that the Dairy Processors have been slow in adopting a marketing approach. They have only recently begun to appreciate that they themselves could benefit by investing in marketing and sales campaigns. An exception is Paramount cheese which has adopted this approach for some time and has rapidly expanding markets.

UHT milk production did not reach the targeted level mainly because the calculated capacity in the industry changed after activities started in 2001. One major processor, GBK, lost a UHT line and another, Alpha Dairy experienced delays in installing its UHT line. Lack of packaging capacity for UHT milk also constrained increase in consumption - the domestic consumption of UHT milk declined by about the same volume as the export of UHT milk increased. Lack of funding for the processors to purchase packaging material for UHT milk before processing contributed to the low sales. Prices of packaging material is up to 20 % of sale value of UHT milk.

According to discussions with macro-processors the viability and utilisation of installed capacity for macro-processors was greatly reduced by unreliable supply of electricity/water and the high cost of running generators, though this could not be quantified.

Although linking producer groups, individual producers, and microprocessors to micro financing institutions has been part of Land O'Lakes activities, only limited success has been experienced in that area. Often clients have not proceeded and during field visits in the West they said that they never heard back from Land O'Lakes, seeming to believe that it was Land O'Lakes who could provide funding in the form of loans.

5.1.4 Financial and economic aspects of the LOL activities

As shown in Section 5.1.3 the production enhancement, processing and value addition support and market development activities of the LOL have significantly contributed to the achievements of the consortium as a whole.

This section discusses some of the key economic and financial benefits emanating from LOL interventions at different nodes of the milk value chain. Highlighted are farmer level aspects, discussion on aspects of the milk bulking centres, and processor (macro and micro), together with an examination of some aspects of efficiency using marketing margin analysis and insights into consumer aspects.

Bulking Centres

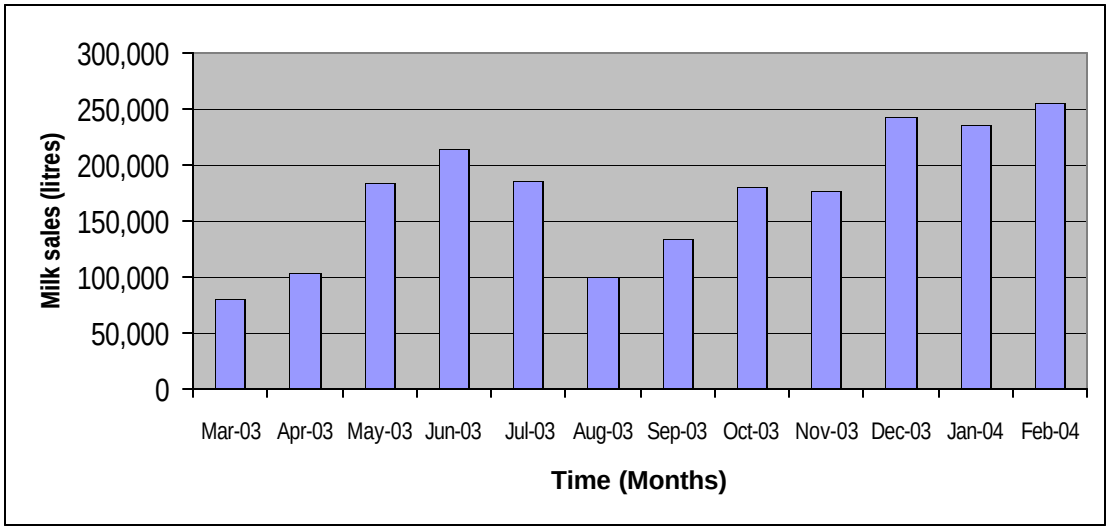
Milk bulking centres acknowledged receiving consortium support including training for both dairy farmers and staff on clean milk handling, animal diseases, record keeping, business development. The majority also acknowledged that they were greatly assisted to undertake formal registration of their associations. These interventions have resulted into changes at the bulking centre level. Table 5 shows a selection of indicators for milk bulking centres.

Table 5: Selected indicators of impact at milk Bulking Centre / farmer association level

Indicator	Baseline	Current
Volume of milk received/day (litres)	1,384	6,233
Mean milk purchase price shs/ litre	221	200
Mean milk selling price shs /litre	244	320
Mean membership of each cooperative group	55	70

The volume of milk in litres/day received by the bulking centres / farmer association has increased by about 285% from an average of 1,384 litres delivered per day three years ago to the current average of 6,233 litres delivered per day today. This is a major achievement. See also Figure 1 for a graphical representation of monthly milk sales for Ntungamo Dairy Farmers Cooperative Union (NDAFCU).

Figure 1: Volume of milk sales in litres/month: (data for NDAFCU).



It is worth noting in Figure 1 that milk sales have generally trended upwards despite the slump in sales experienced during August 2003 possibly owing to drought and a subsequent reduction in milk supply.

Field visits in the areas in which NDAFCU is operating indicated that in that part of western Uganda the purchase price of milk has fallen by over 10% over the last three years. This is a further illustration that milk demand has failed to keep up with supply to the extent that an increase in supply *ceteris paribus* leads to a fall in the purchase prices of milk. In real terms (1997/98 =100) the present price of Ush 182/litre is still lower than the real price of Ush 200 prevailing two years ago. The mean milk selling price on the other hand has increased by 24% in nominal terms and 23.5% in real terms.

Membership of farmer associations has increased by about 21 percent over the project life. The increase in membership is certainly attributable to farmer sensitization, perceived benefits and involvement of LOL as a neutral partner in cooperative development.

Generally many of the farmer association met praised the consortium interventions. They reported the direct benefits to include improvement in milk cleanliness, stronger management and administrative structures, more sensitized farmer members, formally registered farmer associations, existence of business plans, qualified milk assistants, enhanced farmer participation in the market and improved record keeping and accounting procedures. Clearly there has been growth in sales revenue and gross margin as demonstrated by data for NDAFCU shown in Figures 2 and 3.

Figure 2: Revenue and Expenditure trends for Ntungamo Dairy Farmers Cooperative Union (NDAFCU) March 03 – Feb 04

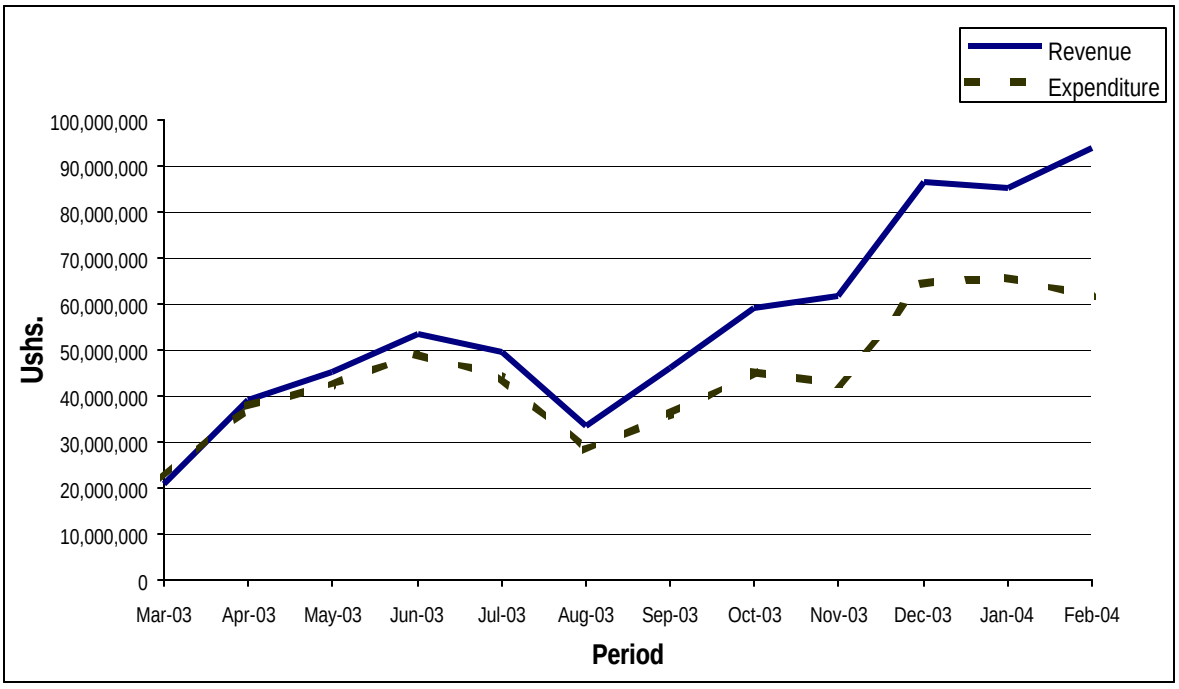
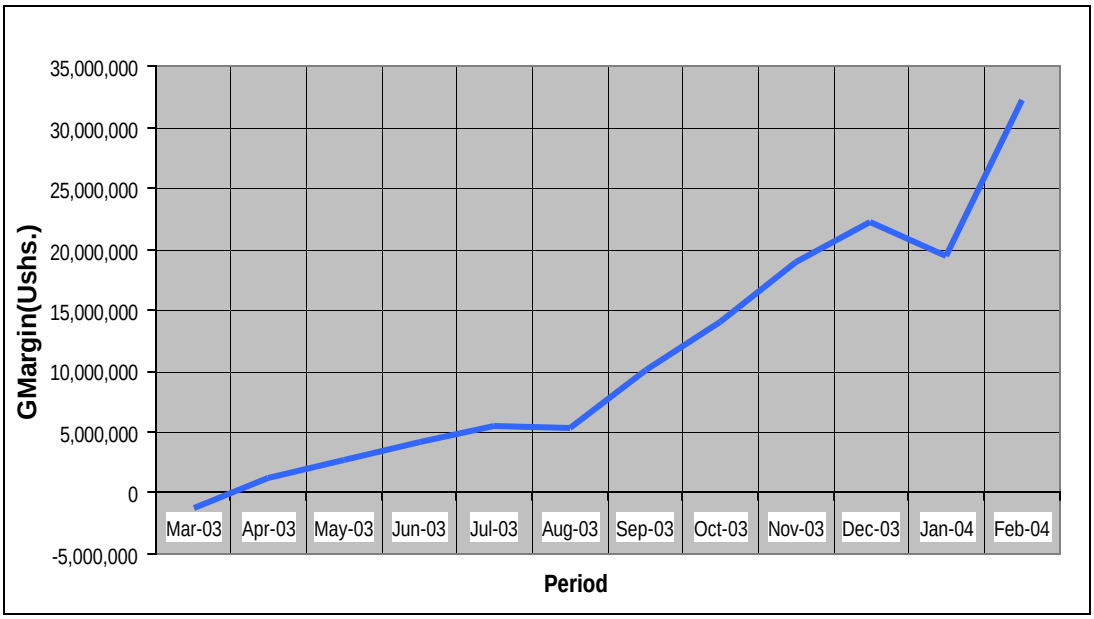


Figure 2 does depict health business growth by many standards. It is noteworthy that this cooperative union was in deficit just a year ago but it is currently recording a surplus. It is also clear that during early and mid 2003, the revenue and expenditure positions of the union were too close for comfort. However, after the slump August 2003, the gap between revenue and expenditure has been widening. This could be a result of several factors but certainly good management, increased milk receipts and sales, cost reductions are some of them.

Figure 3: Trend in Gross Margin for Ntungamo Dairy Farmers Cooperative Union (NDAFCU) March 2003, February 2004



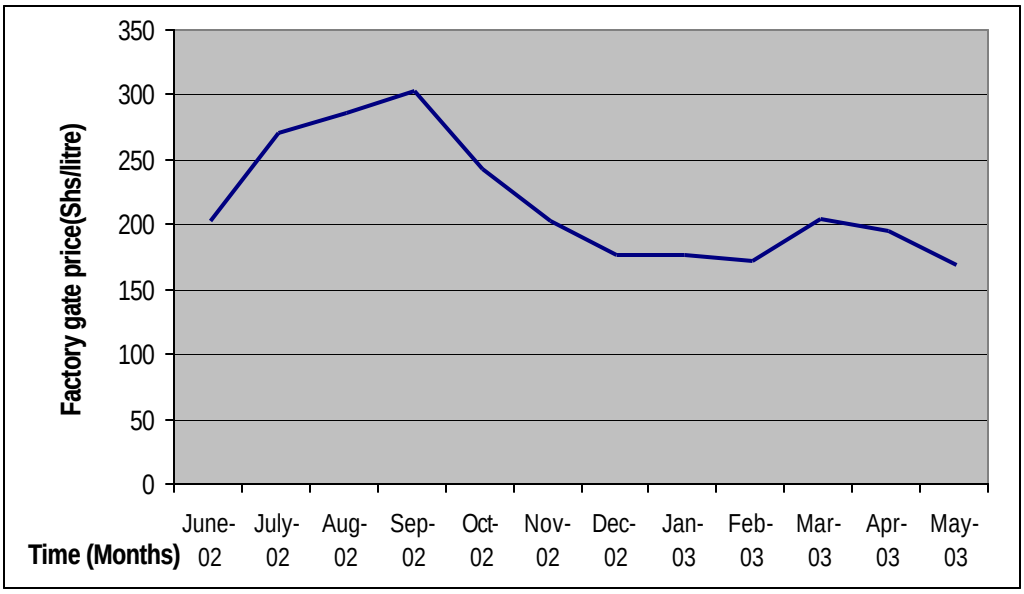
As noted in Figure 3, except for a brief fall at the beginning of this year, the gross margin for Ntungamo Cooperative Union has generally trended upwards. The slight kink manifested in August 2003 is probably a result of the dry season but the Union quickly recovered from this. The sharp rise in gross margin after Jan 2004 is also worth noting. Similar trends have also been apparent in larger bulking groups such as BUDICU and ADP. It was clear to the consultants that these improvements would have been very unlikely without LOL interventions.

There are cases of those Unions that are still attempting to take off. For instance, Bugusege Women Livestock Cooperative Society Ltd (Mbale), recorded a gross margin of Ush 1,625,213 as of 31st December 2003 compared to a gross margin of Ush 2,605,554 the previous year. What is important to note however, is that despite a decline in profits of 60%, the union is still recording a positive GM, meaning that it is able to meet some of its fixed costs. With continued support, this society has the potential to make a turn around.

The Bugusege margin is consistently Ushs 120/litre of which Ushs 50 is paid to DCL for transport leaving Ush 70/litre for operational costs. When DCL purchases at Ush 320/litre farmers receive Ush 200/litre. When DCL raises the price to Ush 350/litre, factory gate price is raised to Ush 230/litre. DCL actually appears to play a price stabilisation role although it may have monopolistic tendencies.

Where DCL does not operate such as in Kabale, we see a higher fluctuation in factory gate price to farmers. This is because purchase price is linked to local demand. Data for Kabale Tukore Dairy Cooperative Society presented in Figure 4 is illustrative. The issue here is that farmers who sell milk to a bulking group which is linked to a processor may benefit from more stable sale prices for their milk which has a positive impact on household incomes.

Figure 4. Behaviour of farmer milk prices, Kabale Tukore Dairy Farmers Cooperative Union



A similar trend applies to other macro bulking centres such as the Bushenyi Dairy Industry Cooperative Union Ltd (BUDICU) although their accounts need a lot of improvement. The format lacks consistency and for some reporting periods only revenue figures are pasted with no indication on the expenditures. Thorough review and regular feed back by consortium staff is a good way to rectify this anomaly. Indeed, Union leaders observed that they were not receiving regular feed back on the accounts submitted to LOL offices.

Examination of the balance sheets of some of the unions reveals a healthy asset status, both fixed and current. Some of the fixed assets include milk coolers, water tanks, vehicles, generators, computers, milk cans, and furniture among others. However, it is likely that some of these "assets" are actually DCL property in which case they are erroneously recorded as union assets. While some do, there are still those who do not allow for depreciation as a cost on these fixed assets. This needs to change.

5.1.5 Conclusions

- Overall management of the consortium by LOL was well conducted and grouping LOL, HPI and WWS into a consortium has been beneficial for clients as each has contributed to the goal and objectives of the project.
- Although considerable training was carried out with clients, reactions from the field indicated that this was insufficient and that more follow-up training would have been very beneficial. LOL achieved a great deal in training as can be seen from Tables 2 and 3 but it would have benefitted from more training staff to enable it to meet the demand.
- Results have shown that promotional activities, instigated by LOL, are impacting consumer awareness and tastes, and younger people are more influenced than those over 24 years. This highlights the need to continue to target primary schools, through, for example, school milk campaigns to develop a milk drinking culture.
- Regarding the issue of exports, studies initiated by LOL have indicated that there are markets for milk in surrounding countries, and that that milk from Uganda should be competitive, yet export of milk has been slow to take off for the reasons given above. This demonstrated the need to continue to pursue aggressive export strategies and to work together with bodies such as SCOPE and RATES.

- Milk quality and the fact that such a large proportion of milk is sold raw to the public remains an outstanding issue. There is a need to continue to work with DDA to engage the informal milk sector closely in with a view to improving milk quality.

5.2 Heifer Project International

5.2.1 Objective and Activities

The aim of the production intervention was 'to increase the availability of milk in milk deficit areas while increasing the productivity of commercial milk producers'. The three partners, Land O'Lakes, Heifer Project International, and World Wide Sires, have previously worked together to implement dairy development activities in Central and Western Uganda. During the three-year period from 2001 the effort shifted to the 'milk-deficit' regions of eastern and northern Uganda with emphasis on improving productivity, development of private breeding services, and expanding environmentally sound farm management practices. This was achieved by undertaking the following five activities: In-calf heifer distribution scheme; Training Extension Agents; Providing Private Breeding Services and Agricultural Supplies; Training Farmers in Productivity-Enhancing Farm Management; and Training Farmers in Environmentally Sustainable Farm Management.

HPI executed the in-calf heifer scheme and trained experienced farmers in animal husbandry, pasture management, feed conservation, natural resources management, improved breeding practices, farm record-keeping, milk handling, zero-grazing, use of biogas, animal health, sustainable agriculture farming methods/environment protection. New farmers were trained in the same disciplines plus animal shade construction. HPI is a source of American genetics it imports through ABS.

The three partners developed joint farmers and technicians training programs and complemented each other's efforts to the extent that in instances it is difficult to separate numerical attributes. A wide array of good training materials has been prepared by HPI and is frequently borrowed by other development partners in Uganda. It includes several brochures some of which are listed in **Appendix 8**.

5.2.2 Assessment of Achievements Against Expected Outputs

The extent to which the intervention objective was met by HPI is highlighted in Table 6. HPI enumerated performance indicators that served as the output targets for the evaluation. Values were from reports until April 2004 updated by personal contacts.

It was difficult to verify specific numbers to the level we would have liked during brief field stops. But, random verifications revealed general agreement between figures obtained from reports and those gathered from field staff or producer group leaders.

HPI managed to initiate all the activities they had planned for and in most cases surpassed the targets. The success of HPI in meeting its targets can be attributed to its long implementation experience in Uganda. HPI expects to distribute another 125 in-calf heifers by the end of September 2004 to bring the total to be given out to 1,025 animals, the increase from 910 targeted made possible because of favourable exchange rates. Distributions made until March 2004 are given in **Appendix 7**. HPI will thus be able to impact on the livelihoods of 13% more families than it had previously envisaged in the target regions. Many of the farmers to receive these heifers have been trained and are waiting final inspection. Importation of semen was delayed because of the import ban. The additional 12 biogas units will, according to HPI, be constructed by the end of project in September 2004.

Pass-0n gifts

As a result of the heifer distribution 284 heifer calves were subsequently born, but only 20 have been passed on. The small number of pass-ons is because heifer calves are reared to at least one year of age

before being passed to another farmer and many heifers were not distributed until well into the 3-year project cycle. Appendix 7 clearly shows that a further 284 female calves are being prepared to be passed on when they reach at least 12 months of age.

Farmers participating had been trained and maintain four levels of on-farm records about their herd structures. These are a) milk production, consumption and sales, b)animal health problems, c) inseminations and reproduction, d) income and expenditures. Most farmers were doing a good job though at substantial time cost to themselves and extension agents. Data quality together with how advice given was recorded in their books suggested that strong and regular interactions go on between project extension staff and producers. This was also reflected by the appearance of animals, animal facilities, forage and other farm facilities of recipients. At the request of the team, visits to problem farmers also revealed what may occur when beneficiaries fail to heed the advise of extension staff. Spontaneous unscheduled visits were made also to non-project participating farmers to make better comparisons.

Table 6. Checklist of HPI activity achievements measured against planned performance indictors

Activity or Task	Planned Targets	Results Attained	Remarks
1. In-calf heifer distribution	10 recipient groups to be trained.	22 recipient groups trained	
	Distribute 900 in-calf heifers to new farmers trained in 10 eastern and northern region districts	910 in-calf heifers have been distributed together with 20 pass-on gifts	58-60% of beneficiaries are women. 125 more heifers will be distributed. All districts have received animals, ranging from 25 in Apac to 107 in Sironko district. 284 female calves have been born but only 20 reached a year of age and have been passed on.
2. Extension and AI Staff	At least 15 extension agents to be trained. 1 Coordinator for the northern region 10 motor cycles 10 AI kits to be imported 2 vehicles for coordination	32 extension staff trained 1 Coordinator recruited 11 motor cycles purchased 10 AI kits imported 2 vehicles purchased	Extension staffs trained by HPI are retooled by WWS to also provide AI services. A large number of extension staffs are GOU personnel seconded to the project by DVOs. This has advantages in cementing relationships between consortium and GOU agencies.
3. Providing Private Breeding Services and Agricultural Supplies	7,500 straws imported at HPI 7,500 straws distributed at HPI 8,100 packs of Acaricides to be purchased.	7,255 straws imported 6,314 straws distributed 5,400 packs purchased.	The remaining 245 (3% of target) straws will be imported if the ban is lifted and there is verified need. 2,700 packs still to be sourced locally. The delay was due to results of IEE regulations and late approval.
4. Training	4,000 farmers trained in	9,684 farmers trained.	Tree planting was required

Farmers in Productivity-Enhancing Farm Management	zero-grazing and better pasture management practices. Follow-up visits	309,490 multipurpose trees planted by project farmers. 21,516 follow-up visits to recipients and zero grazer farmers made by extension and HQ office staff.	before heifer could be given. Before that most farmers did not plant trees but later appreciated their usefulness
5. Training Farmers in Environmentally Sustainable Farm Management	To construct 100 biogas units. 4 biogas plant technicians trained. 1 biogas fabrication plant to be constructed.	88 biogas units were constructed and are in use. 5 biogas technicians trained from northern central and western regions. 1 fabrication plant installed.	The remaining 12 biogas units will be constructed by September. 20 technical support visits made to biogas beneficiaries. Biogas appliances can now be made and are easily accessible.

Visits to 35 farms, group discussions with a cross section of beneficiaries, and reports, pointed to an in-calf-heifer distribution system that is working well for most farmers that had been adequately prepared and willing to take on the advice of equipped extension service providers. It must be stressed that in some areas the work and impact of HPI and WWS overlapped and positive credit would be appropriately shared. This is logical, for example, because nutrition health and farm management issues impact on milk production as much as they do on breeding.

5.2.2.1 Milk Production and Potential Impact

At the farm level, cow milk yield varied from 5 to 22 liters a day of which calves under 3 months are fed 4 kg, 1-2 kg are consumed by the family, 1-2 kg was occasionally gifted, and the rest was marketed. The other possible source of income from the new dairying effort was the sale of male calves and manure though most was being applied as organic fertilizer to farm crops. Occasionally this was as slurry from biogas digesters for farmers that have managed to install the facility.

Cows appeared to range in weight between 300 and 500 kg varying because of genotype, others had not yet calved, some were at different stages of lactation, others were pregnant, while those distributed in 2001/02 had since grown and many in their second lactation. These factors interacting with the cow's environment, level of nutrition, health and breeding management contribute to the wide range in individual animal milk yields, the average being 12.5 liters per day.

At the regional level it is estimated that if current daily average yield level is maintained (which is minimal since production would increase with parity until fifth lactation), and all female offspring become pass-on gifts and stay in the region, assuming equal sex rations, a survival rate of 95%, calving intervals of 18 months, and a herd replacement rate of 10%, the 900 animals HPI has already distributed, if they continue to be inseminated with quality genetics from HPI and WWS, will over the ten years from the start add an extra 0.8 to 39 million liters in regional milk availability per year. To this has to be added production increases due to genetic improvement from sires with better breeding value, and the effect of higher management levels as beneficiaries improve. It is therefore concluded that the consortium has put in place a dairy production activity consistent with the original objective to increase the incomes for rural dairy farmers by increasing dairy sector competitiveness and productivity.

At current prices benefits to the farmer would approximate 3.6 million shillings ($1,910) the first three years from milk sales (Ush 2, 287,000), female calves (Ush 997,500), male calves (Ush 75,000) and manure (Ush 272,500). Major on-farm costs would amount to Ush 525,000 ($275) and relate to treatments (Ush 150,000), extra feeds (Ush 60,000), and labour (Ush 315,000).

To the extent that soil fertility would be enhanced from animal manure, plus better crop and food production from proper on-farm resource management and sustainable agriculture practices, the income and welfare levels of recipients would be significantly higher with time. This could be appreciated from other projects supported by the consortium which have had a longer duration such as the MADDO, Bugusege and Mbale producers groups. To this must be added the hard-to-quantify but important indirect value the heifer makes to environmental protection that many producers would not have undertaken if they had not received the animal.

5.2.3 Constraints Encountered

At the farm level
Some farm management problems were attributable to inefficient hired farm labourers or temporary help. As a result, cattle were irregularly fed, improperly milked, shades were not cleaned and medications improperly administered.

Problems that may affect project implementation
- After producing the milk, many farmers have problems selling the milk. Bulking to facilitate marketing and value addition for higher profits is necessary. Some producer groups have borrowed funds to buy the coolers but second-hand coolers have not been uniformly successful.
- Benefits of improved fodder grasses and trees are widely accepted but supplies of seeds are inadequate in some areas.
- Inadequate nutrition and feed resources, especially the seasonal variation in quantity and quality, is one of the major factors limiting milk production. Moreover, inadequately fed animals, especially the young, tend to be more susceptible to ill health.
- At Ush 2,500 or 6 liters of milk per cow the cost of pour-on acaricides to control Tick borne diseases is expensive even though the application also reduces exposure to trypanosomiasis and other ecto-parasites.
- Farmers appreciate the benefits of biogas plants but the cost remains high, about Ush 1.2 million or a replacement heifer. Some farmers have borrowed money to build their plants, the loan being paid back over 3 years at the equivalent of 3 liters of milk a day.
- Beneficiaries who get a heifer calf immediately pay off their financial obligations. But half the beneficiaries (58% in this group) get a bull calf and some have done so over four consecutive parturitions. Many sell the bull calves for just 30,000-75,000 shs. Bull calves penalize the owners for no fault of theirs.

Problems with a wider implication
- Beneficiaries spend money on the animal shade, pasture preparation, and would ordinarily pay 10-15% of the heifer value. This is expensive and may influence subsequent animal management particularly if funds were borrowed.
- After getting ready to receive the heifer, the time it takes from being certified and receiving the animal has sometimes been long, affecting the relationship between farmers and extension staff. One of the reasons for the delay is that several NGOs operating heifer programs (e.g. Send A Cow, Africa 2000 Network, Christian Children Fund, ADF, PDR, World Vision, Red Cross, Sasakawa Global 2000) are chasing a shrinking number of animals. This is partly the result of the ban on importation of animals into the country.
- The target to distribute 30 heifers a year per district was well intentioned but this number is limited for the interest the project has received.

Suggestions to overcome problems

- Farmers should not hire untrained labour to carry out tasks which can affect productivity and for which they themselves have been trained.
- The consortium should work with cooperatives to ensure that the warranty offered by providers of second-hand coolers and other machinery to farmers are favourable.
- The consortium should try to support some non-participating farmers to become a regular source of pasture and fodder seed.
- Farmers need more training and sensitisation to 'strategic' supplementation using among other products fortified urea-molasses blocks, and fodder conservation techniques. In addition, while feeding lactating animals is often given top priority, the nutrition of pregnant animals in the last trimester (3 months of pregnancy) is just as critical. Consequently, heifers should be distributed so that beneficiaries can take responsibility to feed their animals properly for 2-3 months before calving. This also underscores the problem of the current shortage of breeding stock.
- The feasibility to provide spray pumps to Model farmers for lending out on a rotating basis to group members as a way to reduce the cost of tick control could be investigated.
- Given the clear advantages of biogas in natural resource management and sustainable agriculture, it is recommended that as producer groups start bulking and marketing members' milk, this should provide the opportunity for members to be helped to borrow funds to construct own biogas plants.
- Because the objective of the program is to improve rural farmer incomes, as many are subsistence agriculturists engaged in crop production, HPI should consider widening its involvement to include a package for crop improvement using the bull calves from its milk production component for traction. This would benefit many families in eastern and northern Uganda to grow cash crops like cotton and dry land rice. The strategy would also favour families without the labour input or initial cash capital needed to effectively operate a zero grazing unit. Moreover, the manure component vital for sustainable agriculture would not be disrupted. This concept was developed by the consultants during field visits when it was observed that farmers provided with heifers under HPI and who obtained bull calves were penalised in that they could not pass on a heifer and the bull calves were sold cheaply. Coordination with NARO would be required to develop the most appropriate means of feeding and harnessing the larger sized oxen. Farmers were very interested in this new concept.
- The consortium could allow needy farmers to develop the animal shade progressively as more progeny are raised and milk produced. This also reveals that some people are attracted to the project only by its numerous benefits rather than wanting to be dairy farmers. In the event, some farmers could enhance their incomes by engaging in other activities other than dairying, for example pure cropping with animal traction, poultry rabbit or goat production. HPI has experience in these areas and could consider introducing them for farmers with different needs and abilities even within the same geographical region as long as its original objective to increase farm income is met.
- The team strongly feels that the impact of the in-calf heifer distribution scheme can be increased if additional numbers were distributed in the region. Since the initial infrastructure for administration and farmer training is already in place, the cost to the financing agencies would be lower.

5.2.4 Lessons Leant

- Despite recognised constraints the milk production program has succeeded in increasing local milk supplies in the 'milk deficit' areas of eastern and northern Uganda. Farmers willing to be trained and are adopting the improved technologies are beginning to enjoy the economic benefits.
- In order for producer farmers to realise maximum benefits from dairying, the key steps in the chain from production to consumer need to be integrated. The implication of this to the consortium is that the expertise each partner has should be optimised to provide a multidisciplinary approach to the complex problem. While grouping partners into a consortium has assisted this process, more regular formalised meetings of the three partners would facilitate this process.

- Much can be achieved by international development agencies and NGOs working closely with local and central government departments to implement projects that have a major rural focus.

5.2.5 Benefits from the Project

5.2.5.1 Effect on Rural Family Welfare and Income

- The activity has addressed the gender balance issue in rural development. Approximately 60% of the beneficiaries have been women. They have been trained (in basic aspects of animal production and health, fodder production and conservation, resource management, environmental protection, other on-farm income generating activities, family nutrition though family planning has not been amplified) and are empowered with skills to become good quality entrepreneurs, small-scale farmers, and community leaders. Many head their households.
- The project targets the needy that are prepared to make an initial financial contribution and willing to be trained and adapt necessary technologies. The spectrum of beneficiaries included retrenched soldiers, widows and HIV victims. One retired beneficiary summed up his appreciation by saying the project had given his family a lifetime pension and happiness. Organising beneficiaries into producer groups means that during training farmers think and address issues collectively. Better ones also help those lagging behind or are illiterate. With the income they get from milk and other farm produce, some groups have formed cooperatives.
- The activity's approach to training farmers has widened the traditional method that formerly emphasised animal production: producers are now also exposed to leadership qualities at family and village level, and some subsequently become Model farmers.
- To the extent that introduction of a dairy heifer improves the income of rural families, many developers and government officials regard the package as a right step in the GoU Poverty Eradication Action Plan (PEAP). Since bad behaviour and crime tends to follow from poverty and unemployment, some leaders suggested to the consultants during field visits that the program could be considered for diverting young men from crime.
- The baseline study for the consortium activity did not provide data on income levels from milk production. In the target area for this activity, the milk deficit eastern and northern region districts, the traditional commodities from which farmers draw cash income are seasonal crops (maize, simsim, cotton, ground nuts, cassava, yams). Introduction of a dairy cow component presents beneficiaries with the opportunity to earn a steady income, which after passing on the gift could be year-round when the herd is built to two milking animals. With the money some older beneficiaries have built decent family houses, paid secondary school fees after the Universal Primary Education (UPE), and managed to pay for privately sponsored children at university. Gross farm earnings of new beneficiaries from milk sales was estimated at Ush 60,000 to 140,000 per month (Ush720,000 to 1,680,000 per year). Compared to annual earnings of less than Ush 450,000 from the other on-farm cash incomes, milk production is a competitive undertaking. Returns to livestock under zero grazing in older projects have shown returns of Ush 500,000 to 962,000 /livestock unit/year depending on location. This is significantly higher than returns of Ush 200,000 to 450,000 for cows raised under semi-intensive management, and just Ush 45,000 to 75,000 for animals raised communally. It was reported that once properly established less than 10% of the income of beneficiary farmers comes from outside the farm activities.
- With proper training of producer groups in crop-livestock integration, many farmers should eventually become self-sustaining in the seeds they need for fodder crop production to adequately feed the animals. The foundation for this has been the 309,490 multipurpose trees planted by project farmers under the heifer distribution scheme.
- The consortium collaborates with the Departments of Livestock Health & Entomology, and Animal Production and Marketing of MAAIF and District Veterinary Officers often second extension staff to the program. This is cost-effective for both sides and helps to cement the relationship between NGOs

and GoU agencies. Such a relationship can make it easier to negotiate for GoU departments to shoulder some of the financial cost of services provided.

- The fact that producer group committees are set up to take regular administrative responsibility of the project in their locality means that peer pressure works on those that would drag the program backwards. The fact that avenues have also been developed to 'reward good farmers' and 'penalize the bad' is also positive for the sustainability of these groups.
- The cost of pour-on acaricides appears expensive to most newly established farmers, and maintaining exotic animals under zero-grazing reduces exposure to disease. But ticks carried in gathered forages can introduce tick-borne diseases. The milk deficit area also lies within the tsetse-infested belt. So use of acaricides prescribed by HPI benefits farmers by protecting cattle from potentially fatal diseases.
- Health problems under zero grazing often cause low mortality except in younger animals, and the present level of 5.7% is tolerable among beginner-farmers.
- Up to 1,025 heifers will be distributed in the targeted 10 milk deficit districts. Regional milk availability will steadily increase from .8 million liters the first year to 39 million after 10 years.
- Between 1 and 2 liters of milk is consumed by family while 1-2 may be gifted. This enhances family health and food security, especially among the children and elderly. Although relevant data are lacking, field visits by the consultants confirmed the role of the lactating animal among HIV affected beneficiary families. Not only was the health of the victims improved through milk consumption, but also the extra income allowed them to buy the drugs they need drugs to improve their health.

5.2.5.2 Effect on the Environment

- The benefits of biogas are numerous. It is a clean, convenient and time saving fuel. An HPI-sponsored consultant[9] has reported that biogas reduces most cooking times by half. It is cheaper than electricity (for an average family about Ush360 per day or Ush 132,000 annually). Assuming fuel wood is used, transition to biogas would save 876 kg of wood a year, equivalent to 0.3 acres of medium dense tropical high forest. Generally in the project area nearly all land is in private hands with land tenure documents in the hands of owners. This means that fuelwood saved by the use of biogas units is a genuine saving since trees are owned by individuals and it would be illegal for others to cut them. Moreover, the slurry is useful fertilizer that may improve maize yield by 190 kg per ha per year (an extra Ush 57,000 per ha at Ush 300 per kg farm price).
- HPI training (see Table 6) and informal, voluntary exchange visits between farmers, have encouraged new beneficiaries of the heifer scheme members to quickly adopt the recommended environmental protection strategies. Manure gets applied to farm food, cash and fodder crops, leguminous fodder and fuel wood trees were being planted, and those that could afford were constructing biogas digesters and enjoying the advantages this adds to sustainable agriculture. The system promotes organic farming. This indirect function of the heifer, to get farmers involved in environmental protection technologies more readily than they would if they had no heifer, is hard to give a monetary value.
- HPI training of farmers to diversify their farm activities has had the advantages of spreading risk and covering gaps in income when milk production levels decline. The fact that diversification is tailored to what resources farmers have, are interested in doing, and how well they can look after the alternatives (bananas, pineapples, rabbits, poultry, goats, pigs, vanilla, coffee) is significant.

5.2.6 Economic Aspects of the Activities of the Heifer Project International

Two principal measures of profitability are used to offer insights into the impact of some of the interventions led by the Heifer Project International (HPI). They are **net profit per cow** and **net profit per day of labor invested in livestock.**

[9] T. Muriama: Extended Benefit-Cost Analysis of the Biogas Production and Use Program. HPI 2001

The analysis draws on the analysis by Keyser[10] (2003). The study estimated an annual net profit of Ush187,210 per herd of three cows under typical grazing and Ush 685,150 per herd of 3 cows under improved grazing. On a per cow basis, these translate into Ush 62,403 per annum and Ush 219,383 per annum for typical and improved grazing, respectively. Given that the poverty line in Uganda is about Ush200,000 per household per annum, *shifting management of one cow from typical to improved management potentially moves a household out of poverty* (ceteris paribas)**.** We could not obtain data on the net profit stream of the entire productive life of a cow to afford an estimate of the net present value.

For most rural households in Uganda and livestock production in particular, capital and labor are the major constraining factors. It is thus a worthwhile undertaking to compute net returns to labor as a measure of the magnitude to which labor invested in livestock production is remunerated. For zero grazing, Keyser (2003) estimated USD 0.19 or Ush 368 as net profit per day of labor under typical management system and USD 0.69 or Ush 1,332 as net profit per day of labor under improved management. On a per cow basis, these data are Ush123 per day of total labor under typical management and Ush 444 per day of total labor under improved management . It is rather disturbing that these figures fall below a typical wage rate in Uganda that would be the opportunity cost of labor. This underlies the need to increase the number of stock to make labor investment economically profitable. Assuming a daily wage rate of Ush 2,000 then the herd size that would remunerate labor at the opportunity cost would be a minimum of 5 cows.

5.3 World Wide Sires

5.3.1 Objective and Activities

WWS provide a specific input into the consortium, to contribute to breeding, within a mandate to increase production covered by HPI. WWS thus worked with many of the same producers that HPI was involved with, providing them with intensive training and certification of AI technicians, AI business management, effective delivery of private breeding services to producers, record-keeping and production advisory services. WWS is a major source of American genetics in Uganda. A list of brochures and training material used by WWS is highlighted also in **Appendix 8**.

5.3.2 Assessment of Achievements Against Expected Outputs

The extent to which the intervention objective was met is highlighted in Table 7 using performance indicators WWS had enumerated as targets for the assessment. The period covered is until April 2004 updated by personal contacts with WWS staff to include recent performance and level of activities they expect to undertake before September 2004. WWS managed to initiate all the activities anticipated and surpassed a number of targets. The ban on importation of semen from USA has prevented its targets on importation and use of semen from being reached. The major shortfall will be the two cattle shows which WWS is not able to implement by September.

Interactions with beneficiaries indicated that the advantages of AI are well appreciated by farmers, butso are the problems. Farmers are trained and maintain on-farm records that will be vital in developing the national herd register and breed associations. It is important to note that the consortium project alone cannot absorb all the semen imported by WWS and HPI. Much genetics is sold nationwide providing an indirect impact of the project to grow the AI industry in the country.

[10] Keyser, J: Uganda Private Sector Dairy Industry Development – Impact Assessment. 2003

Table 7. WWS activity achievements measured against planned performance indictors

Activity or Task	Planned Targets	Results Attained	Remarks
1. Extension and AI Staff	12 breeding consultant seminars.	21 breeding consultants seminars conducted 33 new AI technicians recruited 5 new private AI centers established	Extension staffs trained by HPI are retooled by WWS to also provide AI services. Some extension staffs are GOU personnel facilitated by project. A group of inseminators is encouraged to form a center pool and get linked to UNFAI.
2. Providing Private Breeding Services and Agricultural Supplies	45,000 straw imported. 45,000 straws distributed. 12 cattle shows to be conducted. Develop the Hard Book Develop Breed Associations Train AI technicians	28,500 straws imported 23,400 straws distributed 8 cattle shows conducted 28 new AI technicians trained	1,186 straws to be distributed. Permit for 15,000 straws lodged. There is a ban on US semen imports. Two cattle shows planned for Kabale and Jinja
3. Training Farmers in Productivity-Enhancing Farm Management	45 farmer training seminars in breeding services. Follow-up visits	50 seminars conducted. 1,263 follow-up visits to in-calf recipients and zero grazer farmers were made by extension and HQ office staff.	10 seminars are planned before end of September.

Efficiency of AI under zero grazing is critical as fertility is the product of cow fertility x efficiency of the inseminator x semen fertility; and none should be less than 90 percent. The genetic quality and fertility rates of semen available through the consortium, has to be optimised for enhancing regional milk production. The farmer selection, preparation, training and follow-up visits programs extended by HPI and WWS are consistent with reaching and maintaining these standards.

5.3.3 Constraints Encountered

At the farm level

- Farmers and extension staff often spend much time keeping on-farm records as requested by the consortium. These data are regularly forwarded to HQ but farmers have yet to appreciate the value in such a detailed record keeping system. They visualise record keeping as part of monitoring and evaluation and expect to be advised on what their performance data reveal.

Problems that may affect project implementation

- Although there is almost one extension staff per producer group, sometimes it is hard to access the agent. Inadequate contacts can particularly affect the cost of AI as cows may be inseminated late with higher chances for repeat breeding.
- Inadequate nutrition and feed resources, especially the seasonal variation in quantity and quality negatively influences cow fertility.

Problems with a wider implication

- To a small extent the AI program was delayed because of restrictions on the importation of genetic material for fear of bringing in diseases such as BSE (mad cow disease)
- When regular supplies of liquid nitrogen are interrupted AI services are frustrated and farmers may resort to breed their animals naturally. This defeats the objectives of AI and revives the problems associated with the communal bull.

5.3.4 Proposals to overcome problems

- The consortium should encourage dialogue to get the reasons for imposing the ban on semen and breeding cattle to be re-visited. There is urgent need to add more variability into the available dairy animal germplasm, otherwise the quality of the breeding stock will continue to decline. The consortium should give support to getting a scientifically-authoritative position from the OIE communicated to GOU policy makers and technical staff on the risks of BSE (mad cow diseases) transmission in frozen semen and live animal imports. In the meantime, the best position is to continue importing the semen of those bulls that were authorized prior to the ban. This will be limiting Uganda from importing the latest genetics of higher breeding value bulls but that available would still be better than many alternatives. The position of last resort would be for the project to allow funds to be used to import semen from the other authorized countries such as New Zealand, Israel and South Africa.
- The training programme of the consortium should be strengthened to where some Model farmers could be trained to become rural community based service providers including insemination.
- Policy limitations currently limiting regular supplies and distribution of liquid nitrogen have to be addressed appropriately to support genetic progress in milk production. LOL recently commissioned a consultancy addressing the liquid nitrogen situation.

5.3.5 Monitoring of private AI practitioners

Farmers expressed concern that rebreeding is sometimes expensive when their animals return to service one or more times after being inseminated. The shortage of liquid nitrogen can cause semen to be killed if the AI flask is not replenished punctually. Farmers were occasionally found to have resorted to use of natural service when insemination fails repeatedly. The regulatory body for artificial insemination in Uganda is the autonomous National Animal Genetic Resources Centre and Data Bank (NAGRC & DB). Its objective is to spearhead the gradual privatization of breeding activities including procurement and distribution of semen and associated equipment, liquid nitrogen production and distribution, training artificial insemination and embryo transfer technicians, cryo-preservation of semen and embryos, and training farmers in fish breeding techniques. To the extent that NAGRC & DB activities impact on the objectives of DDA, the latter ought to have an interest in what is going on. Because the objective is to work towards eventual privatization of the services, it would perhaps be unfair for NABC&DB to be a player and arbitrator. Under the present circumstances, WWS is encouraging groups of inseminators to form their own local cell supervised by regional AI representatives.

5.3.6 Lessons Leant

- When strong support services have been provided, the impact of AI on milk production is beginning to be felt. The interface between the project area and rest of the country is working to mutual benefit.
- There are policy issues still limiting the impact of AI on production which must be rectified, particularly the ban on the importation of genetic material. The consortium should continue dialogue with policy-makers to clarify this matter

5.3.7 Benefits from the Project

The benefits highlighted under HPI were pertinent to WWS with the following specific additions.

- When the benefits accruing from owning a dairy animal are evident, the heifer has persuaded many other rural families to join producer groups and become farmers. Some who cannot wait are attempting to go it alone, even by asking for AI to upgrade a local animal.
- The opportunity to use AI to breed their animals allows farmers in the consortium the opportunity to improve the genetic quality of their animals. In as much as the inseminators can service the animals of other farmers in the area, there is also a positive impact on national milk production.

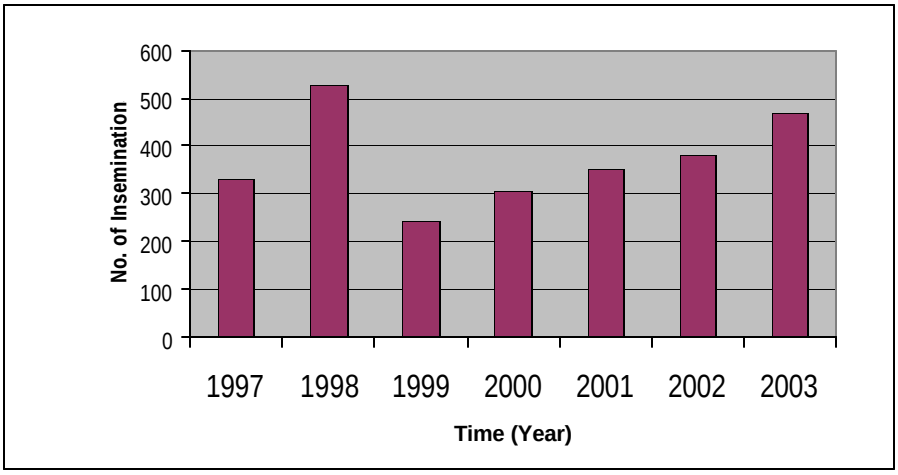
5.3.8 Economic Aspects of the Activities of the World Wide Sires

When cows complete lactation the profitability from milk sales depends on the proportion of the milk credited as annual income, which is influenced by milk yield and calving interval. The data being accumulated should eventually allow for relevant local values to be generated but **Appendix 6** is an example from Friesian cattle in the tropics. It illustrates the importance of reproduction and breeding on commercial dairying. Cows should milk for 10 months, have a dry period of 60 days before calving to rest before calving in 365 days. High yielding cows as should come out of current AI, can continue milking profitably beyond the 10 months. In contrast when yields are low a downward spiral cannot be avoided. Consortium efforts to improve genetic quality through AI, nutrition and health management are thus well directed.

The consortium has among other things sponsored training programs for Artificial Insemination (AI) technicians. Resource persons were said to have drawn from the NAGRC & DB and the Faculty of Veterinary Medicine, Makerere University.

Farmer appreciation of Artificial Insemination has grown over the period of the consortium owing mainly to training and availability of services closer to the farmers. For instance, the Bushenyi area around Kabwohe recorded a total of 469 Inseminations or an average of 39 inseminations per month. The target is a total of 600 inseminations per year or an average of 50 inseminations per month. Figure 5 shows data for annual insemination for Kabwohe area and Figure 6 depicts the monthly sales volume for AI services in the same area.

Figure 5: Annual growth in AI services in the Bushenyi Area 1997 – 2003



One of the issues to note is that the 1999 data are lower because of a ban on semen importation that was in effect from May – September 1999. Also noteworthy is that semen sales are highly seasonal in essence disrupting the stability of the business. For AI services to be consistently available in the area a certain degree of stability in semen sales is required. There is need to deepen the farmer training and promotional activities so as to increase awareness and demand and even out the seasonality in sales.

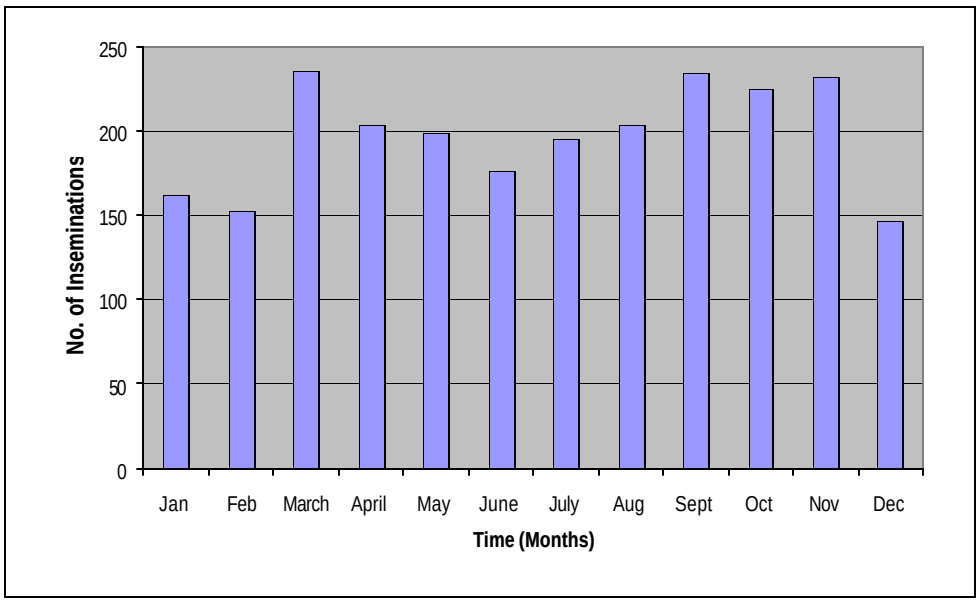
Some of the factors attracting farmers to increased use of AI include:

- Higher milk yield of cross breeds
- Better growth rates
- Reduced cost of bull management
- Reduction in diseases
- Avoidance of bulls serving immature heifers.

Farmers noted the following constraints:

- Difficulties in detecting heat period especially in zero grazing units with one animal only
- Need and cost of having an inseminator nearby
- Ushs 13,000 per insemination (plus cost of repeats if required) was regarded as too costly
- Higher feed consumption

Figure 6: Monthly behaviour of AI sales within the Kabwohe area of Bushenyi district, 2003.



Breed preference appears to be in favour of Holstein (Friesian) which reportedly accounts for about 67% of sales followed by Brown Swiss that accounts for 33% of the sales.

6. CROSS-CUTTING ISSUES

6.1 Environmental issues

The proposed activities of the Dairy Consortium for 2001-2004 were examined by independent consultants, soon after activities began, for potential environmental impacts. This included:

Initial Environmental Examination (IEE). This evaluated potential environmental impacts and consequences of project activities. The consortium was required:

- to actively promote use of environmentally-friendly processes, additives and packaging in the production of new products.
- to ensure that adequate training is offered where necessary for new technologies introduced
- to ensure, for milk collection centres development, that an Environment Impact Assessment (EIA) is conducted for significant expansions of existing plants and for new collection centres, especially making sure that adequate effluent disposal and facility siting is environmentally considered

- for the in-calf heifer scheme, to incorporate nutritional education to farmers and to facilitate farmer farm-planning training to ensure that subsistence farmers' dietary needs are met
- for private breeding services, to ensure that the importation and use of genetics and genetic equipment complies with the laws and regulations of GoU
- for biogas unit construction, to ensure that standard approved engineering and construction practices are adhered to, that an EIA study is undertaken, and that farmers spread slurry thinly over fields for sanitary and field fertilisation purposes

Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP). The consortium was required to adhere to the following conditions regarding pesticides:

- Only two pesticide active ingredients are approved for use, namely deltamethrin (synthetic pyrethroid) and amitraz (amidine compound with contact activity). These will be recommended *as pour-on formulations* wherever commercially viable and economically sustainable. Before any other product (e.g. flumethrin) is used, an amended PERSUAP will need to be submitted and approved.
- Enhanced emphasis on IPM with a view towards using pesticides as a last resort.
- Treatment will occur to the extent possible by trained applicators and in any case not by any untrained individuals within the influence of the Consortium.
- Emphasis on choice of a limited sub-set of "least toxic" and relatively safer acaricides registered in Uganda and by the USEPA available in the country.
- Replacement of the above products will be promoted when safer alternatives become available.
- Educate those applying the acaricides to
    - Exercise caution and wear appropriate protective clothing suited to the toxicity and formulation of the acaricide being used.
    - Sprayers should not be cleaned out near waterways or wells
    - Soak pits location and design should be such that they are not conduits for pesticides to enter ground or surface water.
    - Soil erosion control measures should be used to minimise pesticide transport on soil particles.
    - Pesticide containers to be punctured, crushed and disposed of by burial, preferably in protected landfills located above the water table.
    - Emphasis on safe storage of pesticides and on safe ways to dispose of obsolete pesticides as directed by the pesticide-marketing firms.
    - Follow all applicable restrictions, including those on the pesticide label. This includes application rates, personal protective equipment needed, and any applicable waiting period before the use of milk from lactating animals treaded with these products.
- The consortium will, along with partners (e.g., APEP, SPEED and IDEA Project, Agricultural Chemicals Board of Uganda, etc.), work towards strengthening the pesticide registration process in Uganda to avail more and less toxic pesticides in the Uganda market that are also registered by the USEPA.
- Develop a monitoring and reporting process on the use of pesticides in the program and keep track of acaricide registration status.

Pesticide mitigation, monitoring and evaluation

Mitigation. Measures required are:

- Education and training in use of IPM techniques and the safe use of pesticides such as wearing protective clothing, handling of pesticides, and following of appropriate application rates.
- Training in safe methods of cleaning equipment, using soak pits, keeping rinseate away from ground and surface waters, containment and clean up of spills, using soil erosion control measures especially on sloping ground, and using the least hazardous pesticides. The training should include avoidance and training on minimising effects on non-target organisms and ecosystems.

Monitoring: Mitigation measures to be tracked by the consortium using the following indicators:

- Number of extension agents and farmers trained in IPM practices
- Number of farmers adopting IPM practices
- Number of farmers, extension agents and key importers/distributors trained in use of least toxic and safest acaricides registered in Uganda and approved by the USEPA.
- Number of farmers and extension agents trained in safe acaricide application practices
- Number of farmers and extension agents adopting safe acaricide application practices
- Number of meetings held with the national Drug Authority and Agricultural Chemicals Board to support streamlining of pesticide registration process.
- Changes in the Uganda pesticide registration process

The findings of the pesticide monitoring activities shall be incorporated into the formal monitoring reporting for the dairy program. Rather than doing the training within the consortium alone, it is important to coordinate with other related initiatives in Uganda, such as the pesticide safer use and stockists' training conducted by the USAID IDEA and APEP project. Other projects currently providing IPM training to farmers could also collaborate with the dairy consortium program.

Dairy consortium response

The response of the consortium was to instigate an 'Environmental and PERSUAP Monitoring Plan', the results of which are contained in Table 8:

Table 8: Indicators for IEE and PERSUAP compliance

Environment Impact Assessments conducted for new (or expanded) processing plant and milk collection centers	4 Environment Impact Assessments conducted for new (or expanded) processing plant and milk collection centers
Ensure that in-calf heifer scheme subsistence farmers' dietary needs are met	420 farmers (222 females and 198 males) trained in human nutrition and farm planning
Ensure safe pesticides use	485 extension agents and farmers (238 females and 247 males) trained in IPM practices
	397 farmers (206 females and 191 males) adopting IPM practices
	677 extension agents, farmers and distributors (380 females and 297 males) trained in safe acaricide application and use
	349 extension agents and farmers (158 females and 191 males) adopting safe acaricide application practices
Biogas appliance fabrication plant	Workshop manual for biogas appliances production prepared and being implemented
Biogas construction and operation	394 farmers (214 females and 180 males) trained in slurry management

Verification of consortium compliance with IEE and PERSUAP
The evaluation team examined field activity reports and training materials which verified that the consortium took the IEE and PERSUAP requirements into account in its work. Examples are:

- 2003: MADDO Dairies, Masaka engaged a consultancy agency to write an impact assessment report to be forwarded to the National Environmental Management Agency (NEMA). Following rejection of the report by NEMA, the LOL Milk Quality & Dairy Processing Officer provided the consultants with information on dairy waste disposal after which NEMA approved the impact assessment report
- 2003: LOL assistance to East African Dairies with plant installation. Advice given to check with NEMA on dairy wastewater treatment and not to construct their proposed aseptic tank as it would not handle effluent well.
- 2002: Alpha Dairy, Mbarara: LOL provided technical assistance on how to solve problem with wastewater treatment plant and need to obtain alum and lime
- Milk hygiene and transport: working document prepared by LOL on replacing plastic jerrycans with plastic/metal milk cans to carry milk including prices of cans from India and elsewhere. Proposal was accepted by DDA and MOALD and plastic jerrycans have now been banned in Uganda
- Ntungamo Dairy Farmers' Company Ltd.: LOL assistance included an Initial Environmental Examination for new bulking centre and an environmental impact audit on all milk collection centres. Advice was given best waste disposal method during restructuring of the building
- Hazard Analysis Critical Control Point (HACCP). Preparation of practical guide by LOL

Activities which were not instigated/monitored were:

- Under new product development, the number of processors and production staff trained in environmentally-friendly processes, additives and packages.
- Under use of longer lasting milk containers: the number of milk containers purchased. The consultants were informed that the information was requested but not provided by input suppliers
- Under pesticide use: the number of meetings held with the National Drug Authority and Agricultural Chemicals Board to support streamlining of pesticide registration and keeping track of acaricide registration status. No meetings were held because the consortium found that all pesticides used were already registered in the USA and felt that it was not the mandate of the consortium to deal with national bodies like the NDA and ACB, though in this case the IEE PMP should have been revised. It also confirmed that HPI used only the two permitted chemicals as pour-on treatment for cattle.
- Under importation and use of genetics and genetic equipment to be used as per GoU laws and regulations: genetics (semen) complied, but equipment was not monitored

6.2 Gender

The consortium undertook to ensure that interventions would favourably impact women.
Consortium response: Table 9 indicates a considerable impact on gender through empowerment of women to manage farms and livestock for profit. The table shows that in many instances the number of women trained or taking up activities exceeded men. It was noticeable during field visits that women were more often the managers of the zero grazing units than men. Husbands were often content that their wives explained the management of dairy cattle to visitors. Section 5.2.5.1 gives more details of how the in-calf heifer scheme has addressed gender balance in rural development. It was found that gender issues have been adequately addressed by the consortium.

Table 9: Impact of consortium activities on gender issues

Target Activity Performance Indicators	Results Through September 2003
Increased Participation in Natural Resource Management	
3,000 farmers adopting at least one natural resource management practice.	• 6,912 farmers (4,135 females and 2,777 males) adopted zero grazing techniques.
	• 6,433 farmers (3,183 females and 2,620 males) adopted improved pasture management techniques. • 5,001 participating farmers (3,001females and 2,000 males) adopted soil and water conservation techniques. • 309,490 multipurpose trees planted by participating farmers. • 88 biogas units constructed and all in use.
Other Indicators - Increased Competitiveness of Dairy Enterprises	
Increase competitiveness of dairy enterprises.	• 79 coop/association leaders (8 females and 71 males) trained in management skills.
Other indicators - Environmental and PERSUAP Compliance	
Ensure that in-calf heifer scheme subsistence farmers' dietary needs are met..	• 420 farmers (222 females and 198 males) trained in human nutrition and farm planning
Ensure safe pesticides use.	• 485 extension agents and farmers (238 females and 247 males) trained in IPM practices
	• 397 farmers (206 females and 191 males) adopting IPM practices
	• 677 extension agents, farmers and distributors (380 females and 297 males) trained in safe acaricide application and use
	• 349 extension agents and farmers (158 females and 191 males) adopting safe acaricide application practices
Biogas construction and operation.	• 394 farmers (214 females and 180 males) trained in slurry management
Other indicators – Cross-cutting Issues	
At least 150 co-training sessions with HIV/AIDS and/or health agencies.	• 114 co-training sessions with HIV/AIDS and/or health agencies. Attendees included 1,341 females and 1,163 males.

6.3 HIV/AIDS

The consortium undertook to assist in three main areas.

- Using existing networks and community organisations, treatment and prevention messages would be delivered to vulnerable groups living in rural Uganda. This would be done in collaboration with current HIV/AIDS and health workers operating in Uganda to deliver appropriate training, messages, drugs, condoms or other appropriate materials.

Consortium response:

- Table 2 shows that by September 2003 at least 114 co-training sessions had been carried out with HIV/AIDS and/or health agencies out of the proposed 150 trainings to be carried out by September 2004. Attendees included 1,341 females and 1,163 males

- By assisting the dairy industry in Uganda to produce and distribute affordable, quality dairy products, this food source, when made readily accessible, becomes an important nutritional response due to its high levels of protein, calcium and Vitamin A. **Consortium response:** Table 2 shows a 6.5 million litre increase in consumption of processed dairy products in the south and west, an 11.5 million litre

increase in milk availability in the north and east, a 25% increase in average productivity per animal per day of participating farmers, and 420 farmers assisted to obtain heifers were trained in human nutrition and farm planning.

- Use of the in-calf heifer program to get dairy animals in the hands of rural farmers, many of whom may be living with someone affected by HIV/AIDS, giving them direct access to income and dairy products on a daily basis. **Consortium response:** To March 2004 22 recipient groups were trained, 910 in-calf heifers distributed, 7,875 farmers trained in zero-grazing techniques and 21,516 follow-up visits to recipients conducted – see table 2

6.3.1 Program for LOL staff

Land O'Lakes provides a medical insurance scheme for its staff and families through the International Air Ambulance (IAA). This also provides for HIV/AIDS counselling and advice, testing and treatment of HIV with anti-retroviral drugs.

6.4 Health and nutrition

It is evident that , given the high rates of malnutrition, stunted growth in children, and Vitamin A and protein deficiency, increasing the consumption of dairy products would impact positively on efforts to improve the nutritional status of Ugandans. The challenge for the consortium was to ensure that a reliable supply of quality, nutritious, dairy products is available to consumers. The consortium also noted the good opportunities for fortifying dairy products to increase their nutritional benefits in a way that would address the nutritional deficits which Ugandans are facing. It undertook to explore such opportunities during the 2001-4 activity but through funding from alternative sources. **Consortium response:** M&E data indicate that, as a result of consortium activities there has been a 6.5 million liter increase in consumption of processed dairy products, an 11.6 million liter increase in milk availability in the North and East, a 25% increase in average productivity per animal per day of participating farmers. LOL has also, in collaboration with DDA, funded a consultancy to examine the feasibility of a school milk program in Kabale district which may become the blueprint for similar programs.

LOL has participated in inter-ministerial committees examining school feeding and school milk programs. It has collaborated with the USAID-funded MOST program to explore options for vitamin A fortification of milk. The MOST program sponsored a LOL staff member to attend a product fortification workshop in Morocco.

6.5 Healthcare Services

The consortium undertook to continue its work with Uganda Health Cooperative founded through a working relationship with Health Partners - a U.S.-based health insurance cooperative, the Ministry of Health and USAID to provide health insurance to rural dairy producers in Uganda. Under the health "scheme", families pay a quarterly premium that entitles them to a variety of services provided by a nearby health service provider. Services covered under the plan include: Inpatient and outpatient care; Treatment of chronic disease; Costs of delivery; Prevention services; Additional services that require a small co-payment. The key benefits to members of the plan include: access to high quality health care; guaranteed access to a wide variety of health services; predictable health care costs; and reduced health care costs when catastrophic illness does occur. Health care providers benefit from increased revenue, more predictable revenue and increased attendance.

Consortium response: The activity was continued during 2001-04 and has greatly benefitted numerous rural dairy producers. Beneficiaries of the Health Partners scheme are currently: a) Kabale – 40 families with 173 beneficiaries; b)Bugusege – 36 families with 155 beneficiaries; c) Hambana – 36 families with 115 beneficiaries

7. INITIATIVES OF OTHER ORGANISATIONS IN DAIRY DEVELOPMENT

A number of other organisations have initiatives in the dairy sector. The major players are summarised below.

7.1 Government of Uganda (GoU)

The Government of Uganda (GOU) is implementing some wide-ranging initiatives which have implications for the dairy industry. These include the Poverty Eradication Action Plan (PEAP), key elements of which are the Plan for Modernization of Agriculture (PMA) and the Medium Term Competitiveness Strategy (MTCS). The PMA intends to reduce poverty from the present level of at least 35% to 10% by 2017, and in particular to do so by changing subsistence farmers into market oriented commercial farmers. This strategy is linked to food security and conservation of the environment. One of the implications of the PEAP and the PMA is that agro-processing and marketing are fundamental to success. Modernisation of agriculture, leading to increased productivity, requires that farmers have access to a market to sell their products, and that the markets should operate effectively to provide some price incentives to producers. To increase productivity, livestock keepers must have access to inputs such as drugs, acaricides and feeds. Under the dairy consortium activity, farmers are assisted in accessing requirements such as AI, acaricides and planting materials through its partners HPI and WWS. Also, LOL interventions support improved market access through development of cooperatives and milk bulking activities and access to input supplies.

7.1.1 Dairy Development Authority (DDA)

The DDA was established under the Dairy Industry Act (1998). It objectives are to provide coordination and implementation of policies designed to achieve and maintain self-sufficiency in the production of milk in Uganda, promote production and competition in the dairy industry, and monitor the market for milk and dairy products. The DDA aims to promote milk marketing both internally and in the region and the consortium has worked closely with it in this respect. The DDA is also supporting School Milk Programs and consortium assistance is being provided in, for example, a consultancy on the feasibility of establishing a school milk program in Kabale district. The DDA has successfully banned the transport of milk in plastic jerrycans and the open boiling of milk in urban Kampala. It is strategising to effect a ban on trade in raw milk in Kampala

7.1.2 Dairy Corporation Limited (DCL)

DCL is government owned and is the largest dairy processing operation in Uganda. The plant was built in 1969 and rehabilitated in 1992. It can process 150,000 litres/day but often runs at one third or less of capacity due to milk supply problems. At the time of the consultancy it was receiving about 67,000 liters of milk/day. This varies from 30,000 liters in the dry season to over 80,000 liters during the rains. It is able to manufacture pasteurised and UHT milk, yoghurt, butter and ice cream. Currently ice cream is not being produced. GoU is actively considering privatising DCL. The consultants were informed during discussions at DCL that farmers have the right to acquire up to 30% of the holding.

7.1.3 National Animal Genetic Resources Centre and Databank (NAGRC & DB)

The commercial activities of NAGRC & DB include: a)Procurement, production and sale of ova, embryos and semen; b) Sale of equipment for production and distribution of genetic material; c) Production, sale and distribution of liquid nitrogen; d) pregnancy diagnosis. It manages the national animal genetic data bank, national central livestock registry and the national animal genetic resources evaluation centre and laboratory. It collaborates in research on genetic improvement. It trains farmers and AI technicians and has a supervisory role over AI technicians. It aims to shift Uganda's farming community from subsistence to commercial modes of reproduction in line with the Plan for the Modernisation of Agriculture.

7.2 Others

7.2.1 Strengthening the Competitiveness of Private Enterprises (SCOPE).

SCOPE is a USAID-funded activity supporting Uganda's efforts to increase its competitive positioning in the global marketplace. Project duration is January 2004 – December 2006. SCOPE provides technical support to private and public sector stakeholders who in turn are engaged with GoU's own competitiveness framework programs: the PEAP, MTCS and PMA. It supports business leaders in high priority export sectors, one of which is the dairy industry. Its support includes cluster formation, cluster strategy issues, expanding public/private partnerships for competitiveness, and building awareness and consensus.

7.2.2 Productive Resource Investments for Managing the Environment/Western Uganda (PRIME/West)

PRIME/West, which began in March 2004, is a USAID-funded program whose goal is to increase economic opportunities for rural communities in selected districts of south-western and western Uganda. It combines the treatment of systemic regional problems in an integrated manner with the development of high priority interventions to increase rural household income, employment and enterprise development in the region. The districts in which PRIME/West is working also receives income from tourism as they contain some well-known national parks, though the number of visitors are still small. One of the interventions targeted is private sector dairy production for which it may sub-contract to LOL. PRIME/West has its headquarters in Kampala and a regional office in Kabale. It is working in six districts, in three of which it intends to promote, *inter alia,* dairy production and marketing.

7.2.3 Mennonite Development Association (MEDA)

MEDA is funded by USAID Washington under the Dairy Directive. It has a cost sharing arrangement for activities including long-life milk production, promotions for milk products, long life milk processors and quality certification through HACCP. Generally, MEDA will refund 50% of costs for approved activities once the funds have been spent. Several dairy processors have made use of these arrangements. Some dairy processors have received certification under this program.

7.2.4 Other organisations supplying cattle

In addition to Heifer Project International (HPI), there are a number of other organizations trying to improve milk production in Uganda by distributing animals to recipients. The Government of Uganda's own restocking effort may be regarded as the largest. Others, some of which have not necessary adopted the zero-grazing technology, include:

- Send-A-Cow
- Africa 2000 Network
- Christian Children Fund
- African Development Foundation
- Planning Development and Rehabilitation
- World Vision
- Red Cross
- Sasakawa Global 2000

Send-A-Cow previously had a close relationship with HPI as both were under the auspices of the Church of Uganda. Started in 1988, the NGO currently operates in 20 districts. It originally operated with in-calf heifers from the UK but this suffered from the ban on imports in the mid-1990s and in 1997 it diversified its program to also assist beneficiaries with local cattle, meat and dairy goats, pigs and poultry. The constraints to its operations are shared by some others adopting the same basic approach to rural development, namely:

- Supply of good breeding cattle is diminishing
- Cost of liquid nitrogen still affects the efficiency of AI delivery
- There is need for a viable contact mechanism for NGOs and other agencies engaging in rural development using livestock.

In May 2004 it was reported in the press that Send-A-Cow was suspending operations in Gulu district because of its concerns over the level of insecurity.

8. FINDINGS AND RECOMMENDATIONS

8.1 Findings

Extent to which project objectives have been met by the consortium

- Objectives of the project, to increase incomes for rural dairy farmers and to increase dairy sector competitiveness and productivity, have been largely met. However, in terms of the level of increase in consumption and of milk exports, targets were not met and these need to be addressed.
- It was clear from the many responses during field visits, and from GoU and NGOs, that clients are generally satisfied with the quality of assistance and advice provided by the consortium. Its activities have also led to important improvements in natural resource management, human health and employment.
- The project is much appreciated by beneficiaries because it enhances family incomes, food safety, heath, welfare, and status in society.
- District administrators appreciated the project for its potential to increase regional milk availability, in reducing rural poverty, creating agro-based employment, and addressing gender balance issues.
- 13% more heifers than targeted will be distributed by September 2004 because of changes in exchange rates
- Under the HPI/WWS training programmes more beneficiaries than targeted have received training and are undertaking integrated crop-livestock production methods
- HPI/WWS follow-up visits enhanced project sustainability and impact
- The energy saving strategies through use of biogas units are highly valued by farmers. They also add to environmental protection.

Issues arising from project implementation and lessons learned

- Project implementation has been timely and is highly regarded by clients
- Grouping LOL, HPI and WWS into a consortium has been beneficial for clients as each has contributed to the goal and objectives of the project. But the implementation of a single reporting procedure in quarterly and annual reports from 2002 has make it less easy to see the individual activities of each partner
- There is need to investigate the economics of moving milk within the country i.e.surplus to deficit areas as a short-run strategy to increase consumption and improve farm prices. DCL could have tankers supplying milk to the east and safe areas of the north as some private companies are doing.
- There is a need to engage the informal milk sector more closely with a view to improving milk quality
- Promotional activities, mainly by LOL, are impacting consumer awareness and tastes, and younger people have been found to be more influenced than those over 24 years. This highlights the need to target primary schools, through, for example, school milk campaigns to develop a milk drinking culture

- Studies by the consortium indicate that there should be markets in surrounding countries for milk from Uganda, and that that milk from Uganda should be competitive, yet export of milk has been slow to take off. There is a need to continue to pursue aggressive export strategies
- Several studies have been made regarding the feasibility in putting up a milk powder plant, but such a venture has never materialised. The consortium should consider providing more expertise to clarify the issue
- The number of in-calf heifers distributed was small for the interest the project generated. Larger numbers may be considered in new projects or the same effort needs duplication in the same districts.
- Concrete floors of zero-grazing units often disintegrate quickly, perhaps because of using insufficient cement, causing unhygienic conditions for the animal as the floor cannot be cleaned thoroughly. Better training, better supervision during construction of the unit, or revised recommendations to farmers on the recommended mix for concrete making, is needed.
- Commercial dairying depends on adequate supplies of good breeding animals. When AI is used to enhance genetic progress, it is also affected by access to progeny tested genetics. Policies for the current ban on importation of genetics need to be re-examined.

Project impact on marketing chain particularly the effect on household incomes

- There has been a positive impact on household incomes for beneficiaries of heifers and for many of those who were assisted to establish farmer groups geared towards milk marketing and processing. After only 2 years average productivity in milk production had increased by 25% per animal per day of participating farmers. Cost of production per liter also declined by an impressive 49%.
- Assisted by support from LOL the volume of milk entering the cold storage/bulking system increased by 75,520 liters/day.
- Sales of value added products (yoghurt, ice cream, cheese and dairy cream) have been particularly impressive, having risen by 245% in two years.
- In the post production dairy sector 59 new enterprises and 373 new jobs were created.
- These achievements were underpinned by an 89% increase in active membership of democratically-run farmers groups/associations and cooperatives for which training was provided.
- Competitiveness of dairy enterprises was increased by LOL assisting with the development of 10 bankable business plans, and revision of 3 others, for producer groups and microprocessors.
- The provision of coolers for milk bulking has reduced milk losses and enabled farmer groups to manage their marketing activities more economically.
- LOL has assisted DDA to enforce the banning of open-air boiling of milk and of the transporting of milk in plastic jerrycans. These are important impacts on the marketing chain in terms of efficiency and health.
- Sales of pasteurised milk increased by 6.5 million liters (38%) which does not include the sales of Jesa Dairy Farm whose sales figures were not supplied to LOL. UHT milk sales declined by 1.4 million liters (19%) mainly because of business constraints at some major processors combined with a shortage of packaging materials. Exports also increased, though not to targeted levels, and studies by LOL indicated potential for further sales in the region.
- The impact of the use of AI has had an important effect on household incomes. Through use of high quality semen the productivity of heifers and their offspring has led to increases in milk yield, sales and rural incomes. This has been amplified as heifer calves are passed on through the HPI system. In-calf heifer beneficiaries who train and adopt the project methodologies may be rewarded three time their investment from milk sales, progeny value and use of manure in three years. The financial benefits are higher if advantages in better family food security, farm natural resource management and diversification are also taken into account.
- The multiplier effect on regional milk availability from the 910 heifers distributed in the east and north in the three years will consecutively rise from 0.8 to 39 million liters a year over ten years.

Constraints during project implementation and methods used to overcome them

- While provision of micro-finance was not part of the consortium program, it was expected to facilitate clients to access loans. This has been difficult to achieve especially for small scale farmers and processors. The large commercial banks which currently charge interest rates of about 22% will not normally provide loans to them because they lack collateral. The smaller lending organisations may be less demanding on the issue of collateral but charge prohibitively high interest rates of 30-40%.
- Security in northern Uganda hampered wider distribution of in-calf heifers in target districts. This was minimised by concentrating on peri-urban areas. These will be the springboards to increase local production in as the situation improves.
- The output of major processors was lower than expected partly because of business constraints. One company lost the use of a UHT packaging line and another was delayed in commencing packaging operations. Lack of packaging capacity for UHT-milk also appears to have constrained increases in consumption since the domestic consumption of UHT-milk declined by the same volume as the export of UHT-milk increased. Lack of funding for the processors to purchase packaging material for UHT-milk before processing contributed to the low sales. Prices of packaging material is up to 20 % of sales value of the products (UHT).
- Many beneficiaries had problems selling their milk and in debt collection. Some producer groups were accessed loans to buy coolers for bulking in order to ease the marketing problems.
- Occasional AI services were disrupted due to difficulties in upcountry delivery of liquid nitrogen. Encouraging the formation of regional private AI service centres that serve groups of area inseminators helped to improve the delivery of AI and other services.
- The adoption rate for some technologies has not been uniform and some farmers fail to perform up to expectation. Project committees locally administer the HPI model, and some producer groups have zones supervised by zone committees. These local project administrative structures significantly help to apply peer pressure on members, to improve implementation rates, and to meet deadlines. The low adoption rates for NRM activities were not unexpected in a three year program. It is the consultants' experience that it takes several years of exposure to new techniques before adoption rates increase to respectable levels.
- Utilisation of installed capacity for macro-processors is greatly reduced by unreliable supply of electricity and water. More attention needs to be paid to redressing these issues
- High cost of power generators was a constraint to the viability of milk processing in some areas with unreliable electricity supply
- High import tariffs on milk entering Kenya, and competition from large-scale Kenyan processors, constrained exports of long-life milk
- The continuing ban on imports of genetic material from some countries e.g. for fear of BSE (mad cow disease) delayed the full implementation of AI activities to a small extent

Program activities which were unable to be initiated or completed

These were relatively few compared with the large number of activities undertaken – they were:

- LOL IEE and PERSUAP compliance
    - Under new product development, it did not monitor the number of processors and production staff trained in environmentally-friendly processes, additives and packages.
    - Under pesticide use: it did not monitor the number of meetings held with the National Drug Authority and Agricultural Chemicals Board to support streamlining of pesticide registration and keeping track of acaricide registration status. No meetings were held because the consortium found that all pesticides used were already registered in the USA and felt that it was not the mandate of the consortium to deal with national bodies like the NDA and ACB. It also confirmed that HPI used only the two permitted chemicals as pour-on treatment for cattle

- Under importation and use of genetics and genetic equipment to be used as per GoU laws and regulations: genetics (semen) complied, but equipment was not monitored
- WWS
  - It will not be possible to undertake two of the twelve cattle shows that were envisaged because insufficient time remains until end of project.
  - It may not possible to order all the straws of semen because of the current ban on importation of animals and semen.
  - Monitoring & evaluation: did not link with a research organisation to conduct a detailed analysis of its data generated by farmers, as recommended by the 2000 evaluation. As a result farmers have not received the feedback which they have been expecting and which their industrious record keeping deserves

8.2 Recommendations

Further investments needed in the dairy sector
The consultants have concluded that the top priority regions and issues for further support are:

1. **The East and North**: build on the support provided in 2001-3 in the 10 milk deficit districts
2. **The South-West**: in Bushenyi, Kabale, Rugungiri and Kasese districts in collaboration with PRIME/West
3. **National:** milk consumption, export promotion and policy reform

The Central and West regions are a lower priority since they are quite well developed in milk production, processing and marketing, but could also be supported on a demand-driven basis.

1. Recommended activities in priority area 1: the East and North
- Open an office in Mbale and recruit extension officers for (a) milk quality and dairy processing and (b) cooperative/business development
- Re-distribute 10 heifers in each of 10 districts per year for three years (as in 2001-3)
- Provision of artificial insemination (AI) services
- Farmer training in clean milk production, handling, bulking and marketing
- Farmer training in natural resource management and sustainable agriculture
- Train model farmers to act as community-based services providers, including AI.
- Technical support to processors including issues like quality of products, quality of milk, reducing cost of production, cheaper procurement of materials like packaging, quality assurance etc
- Develop linkages between farmer groups, value-adding processors, and milk traders from cooling tanks, for mutual benefits on issues such as reduction of milk losses and quality and testing.
- Financial assistance to producers to enable purchase of milk cans.

2. Recommended activities in priority area 2: the South-West
Collaboration with PRIME/West activities in at least Bushenyi, Kabale, Rugungiri and Kasese districts to:
- Increase efficiency of zero grazing units.
- Improve use of cow dung and biogas slurry.
- Increase environmental awareness in farm management.
- Better use of fodder banks and lagoon strips.
- Better pasture management leading to higher quality milk.
- Train farmers in clean milk production/handling.
- Improve economic development through increased milk production, milk bulking, value-added processing and marketing

- Increase recruitment and support to farmers to form farmer groups and cooperatives to buy milk coolers.
- Provide AI services, and train model farmers as community-based service providers including AI.
- Provide financial assistance to producers for purchase of milk cans.

3. Recommended activities in priority area 3: National issues

Milk consumption

- Expand support to school milk programs
- Continue advertising campaigns to promote milk consumption

Export promotion

- Support individual processing plants according to their needs and cost share through GDA as deemed necessary (see Section 4.2.2).
- Collaborate with SCOPE project to develop processor clusters and to provide assistance with export business marketing strategies.
- Collaborate with RATES project on policy issues, tariff constraints and trade contacts.
- Continue regional and international export promotion through trade missions.

Policy reform

- Support DDA in development of standards and regulations, market research, trade policy and advocacy.
- Support DDA in its efforts to phase out trade in raw milk.
- Support review of policy issues affecting production and delivery of inputs critical to dairy production, in particular liquid nitrogen and breeding germplasm.
- Support workshops and seminars dealing with policy reform and advocacy.

APPENDIX 1 STATEMENT OF WORK

Methodology

The final evaluation of the Uganda Dairy Sector will provide an independent assessment of the impact of the Dairy Consortium Activity and will make recommendations on its future activities. It will examine the key areas which the consortium has been implementing, particularly: (a) market development, (b) processing, marketing and distribution of value-added products, (c) milk bulking and handling (d) production, (e) industry organisation, (f) policy reform. The evaluation will broadly focus on:

- Assessment of the extent to which the objectives of the project have been met by the consortium
- Examination of issues arising from project implementation, and lessons learned which can guide any future programs
- Identification of project impact on the marketing chain, particularly the effect of consortium efforts on household incomes
- Examination of constraints which appeared during project implementation and methods used to overcome them
- Identification of activities which were in the programme but which were unable to be initiated or completed

In addition to, and partly guided by, the findings of the evaluation, provide a broad overview of the dairy sector in Uganda and make recommendations on what further investments need to be made, and where USAID might play a role.

Approach

The consultancy team will approach the evaluation in the following manner

- Review of Literature. Review of existing literature including baseline surveys, previous evaluations, annual and quarterly reports, and Performance Monitoring Plan. Documents will be obtained from USAID, the consortium, and other stakeholders
- Surveys and Interviews. A semi-structured interview approach will be used, aimed at obtaining answers to key questions while enabling those interviewed to expand on areas of particular interest or concern.
- Field Visits. It will be necessary to carry out field visits to various parts of the country, including Gulu in the north. The evaluation team may split into two groups in order to cover sufficient areas of the country in the limited time available. Advice will be sought from the consortium as to which individuals to visit in the field. The evaluation team may modify this to ensure objectivity in the selection of stakeholders to be contacted. In general those to be contacted will include:
    - Consortium staff, consortium clients and other stakeholders such as dairy farmers, producer groups, processors, input supply companies, industry associations and service providers
    - Other donors and NGOs, GoU officials including MAAIF, DDA and DCL
    - USAID staff
    - Other project initiatives such as PRIME/West and SCOPE

Outputs

- Week 1: Within 3 days of starting work deliver a schedule and work plan, to include the evaluation report's table of contents. The work plan will identify individual and joint tasks of team members and proposed methods of information gathering
- Week 3: By the end of week 3, after completing field work, deliver a progress report of major findings to the USAID project officer
- Week 4: Deliver simultaneously to USAIDA and LOL, an initial draft of the final report. USAID/LOL will provide written comments to contractor for inclusion in the final report within one week after receiving the draft
- Week 6: Deliver a final report to USAID and LOL

APPENDIX 2 DOCUMENTS REVIEWED

1. S.J. Staal and W.N. Kauongo,: The Ugandan Dairy Sub-Sector, Targeting Development Opportunities. International Livestock Research Institute (ILRI), 2003
2. John Lichte – Agribusiness Development Centre Report
3. Dairy Development Authority
   - Strategy Document: 2002 – 2007
   - Dr. Florence N. Masembe Kasirye, FAO: Post Harvest Milk Losses in the Small Scale Dairy Sector-Uganda: A Rapid Appraisal.
   - "Towards a Modern, Self-Sufficient and Sustainable Dairy Industry in Uganda"
   - Nathan I. Twinamasiko: Informal Milk Market, Integrating Milk Hawkers into the Regulated Market.
4. Dairy Industry Act, 1998
5. SBO Research for Land O'Lakes, Inc.: Consumer Research Findings.
7. Research International October 2001: Project Cheese Presentations.
8. Steadman Research Services: Report on the Advertising Effectiveness for Land O'Lakes Radio & Print Campaign., December 2003.
9. Steadman Research Services: Follow up Report on evaluation of knowledge & practice on milk and milk consumption in ladies clubs, November 2003.
10. Steadman Research Services: Retail audit on milk and milk products.
11. K-2Consult (U) Ltd.: Report on: Dairy Sector Supply, Demand and Competitiveness Study, September 4, 2001.
12. Global Development Alliance (GDA) Initiative to support the Uganda Dairy Sector.
13. Dairy development Authority: A Strategy for 2002-2007.
14. The Ssemwanga Centre, For Agricultural Food Ltd.: The Uganda Private Sector Dairy Industry Development Activity, Baseline Survey report, April 2002.
15. Proposal/Project Description
16. Uganda Private Sector Dairy Industry Development: Annual Report year one, October 2002, and annual report year two, October 2003. Annual Work Plans – Years I, II and III
17. Development Alternatives, Inc: Evaluation of the Private Sector Dairy Development Activity– 2000
18. Dairy Consortium: Performance Monitoring Plan (PMP)
19. Initial Environmental Evaluation (IEE) & Pesticide Evaluation Report & Safer Use Action Plan (PERSUAP) and consortium's PMP for these
20. Quarterly Reports: 2001 – Oct-Dec; 2002 – Jan-Mar, April-June; 2003 – Oct-Dec, Jan-Mar, Apr-June; 2004 – Oct-Dec, Jan-Mar
21. Field Activity Reports – LOL
22. USAID Trainnet Summary Reports
23. Uganda Private Sector Dairy Industry Development: Impact Assessment. John Keyser – 2003
24. Dairy Development Authority: Feedback on USAID project; Policy Reform and Schools Impact Evaluation
25. T. Muramira: Extended Benefit-Cost Analysis of the Biogas Production and Use Program. HPI 2001

<u>Consortium Market Development Initiatives: Exports</u>

26. Export Handbook
27. Burundi (draft)
28. Tanzania (draft)
29. Export Symposium Report
30. National Export Strategy (draft)

31. Cheese Audit

32. Eastern Uganda Rapid Market Survey – key finding and recommendations

Consortium Market Development: Promotions

33. Reports for 2002, 2003
34. Ladies Club Evaluation (draft)
35. Vantage – Merchandising Campaign Report
36. Promotional Materials: Brochures – Milk (3), HIV/AIDS, T-shirts,Hats, Visors, Vehicles
37. Media Activities: Radio, Print, Posters
38. Advertising Effectiveness Evaluation (draft)
39. School Feeding Program: Proposal to WFP
40. Data Source(s) – DDA, UDPA, UNDFA, clients, service providers (Exp Momentum, Global Innovations, Maneno, Steadman Research Services, Strategic Business Options, Sanyu FM)

Processing, Marketing and Distribution

41. Marketing Training Manual (draft)
42. New Product Development – Business Planning Worksheet
43. Value-added Processing for Milk Bulking Groups – Guidebook
44. Guide to the Hazard Analysis Critical Control Point (HACCP)
45. Financial Management Summary Sheet
46. Business Plan Development Training Manual
47. Business Plans developed for: BUDICU, Nabuka Dairy ,NDAFCU, Anifarm Creamery, ADP, MADDO Dairy, Nyakahita, CAWODISA
48. Bookkeeping Training Manual
49. Financial Management Checklist
50. Volunteer Reports – Cheese Consultant, Business Management Consultant

Milk Bulking

51. Milk Collection Center Checklist
52. MCC and BCC Record Keeping Worksheets
53. Milk Handling Training Manual

Production

54. Farm Level Production Data: HPI, WWS
55. Enterprise-Linked Extension Services Report (draft)

Industry Organization

56. Producer Groups Summary
57. Training Materials
58. Copies of constitutions, by-laws, certificates of registrationManagement Consultant Reports – ADP, Nabuka Dairy
59. Volunteer Reports – Martin Havlovic (2)
60. Data Sources: DDA, associations, producer groups, SPEED

Policy Reform

61. White Papers: Milk Boiling Reform; Replacing Jerry Cans with Milk Cans; Lactoperoxidase; Seal of Quality

Public Private Alliances

62. PPA Guidelines and Application; Proposal Selection Matrix; Approved Alliances; Quality Certification Program

Scheduled Activities Not Yet Completed

63. Financial Management: Regional Workshops – Scope of Work
64. Milk Consumption Workshop – Agenda
65. Kabale School Milk Program – Scope of Work
66. Association Development: Strategic Planning – Scope of Work
67. Commercialisation of Liquid Nitrogen Supply: Consultancy – Scope of Work and discussions with consultant
68. ACDI/VOCA Volunteer Assignments – Proposed assignments

Other
69. HealthPartners Reports
70. Data Source(s) – HealthPartners/Uganda Health Cooperative
Government of Uganda Strategy Documents
71. Poverty Eradication Action Plan (PEAP), Plan for Modernization of Agriculture (PMA)
72. Medium-term Competitiveness Plan
73. Plan for the Modernisation of Agriculture (PMA)
74. National Agricultural Advisory Service (NAADS)

APPENDIX 3 LIST OF PERSONS MET

Name	Position
USAID	
Paul Crawford	Team Leader, Sustainable Economic Growth Strategic Objective
James Dunne	Agricultural Advisor
Sudi Bamulesewa	Advisor/Project Officer
Land O' Lakes	
Bradley Buck	Country Coordinator
Francis Buwembo	Monitoring and Evaluation Specialist
Samuel Sebadduka	Milk Quality & Dairy Processing Officer
Samuel Galiwango	Cooperative/Association Development Specialist
Paul Kimbugwe	Milkshed Manager, Mbarara
Ariong Abbey	Marketing and Business Extension Officer
Irwin Foreman	Dairy Processing & Business Development Specialist
Jane Kisakye	Public – Private Alliance/Training Coordinator
Regina Mukiri	Marketing Specialist
Heifer Project International	
Bernard Muyeya	Country Director
Margaret Makuru	Deputy Country Director
Josephine Ochiraje	Monitoring & Impact Evaluation Officer
World-wide Sires	
James Lwerimba	Director
Dairy Development Authority	
Nathan Twinamasiko	Executive Director
Florence Kasiriye	Dairy Development Manager
Dairy Corporation Ltd	
Charles Beisa	Managing Director
Edison Kadoma	Marketing Manager
Ignatius Ngobi	Field Manager
David R. Bigira	Chairman, Board of Directors
Individuals	
John Anglin	Managing director of Paramount Cheese
John Anglin	Chairman of Uganda Dairy Processors Association
Taj Kassam	Chief Executive of Snowmans Group
Dr. Eswagu	District Veterinary Officer in Nakasongola District
Gaster Muganga	Commercial Officer, Nakasongola District
Peter Maina	Marketing Manager for Alpha Dairies Limited
Patrick Juma	Branch Manager, Uchumi, Garden City, Kampala
Fred Zake	Operations Manager Metro Cash and Carry, East Africa
Ralph Chaffee	Chief of Party, IDEA Project
Taj Kassim	Director, Uganda Dairy Processors Association
Moses Nyabila	Regional Dairy Trade Specialist, RATES project, Nairobi
Nathaniel Makoni	American Breeders Services Ltd
George Lubega	Diocesan director, Caritas MADDO
Joseph Sserwadda	Government A.I. Technician, Masaka
Emmanuel Iga	Veterinarian, Jessa Dairy Farm
Boniface Ssebabenga	Chairman, Wamala Kageye Farmers Cooperative
Damascus Namungi	Secretary, Wamala Kageye Farmers Cooperative
Patrick Kintu	Extensionist/ Inseminator Kasolo Livestock & Housing Project
Abudu Mpwayo	Chairman, Kasolo Livestock & Housing Project

John Engle	Chief of Party, SCOPE project
Tom Mugisa	Program Officer, Plan for Modernisation of Agriculture
Agricultural Consultation and Sector Structuring in Uganda (French Project)	
Patrice Grimaud	Researcher
Alpha Dairy Products	
Nawaz Kurji	Managing Director
James Bugingo	Production Manager
G.B.K. Dairy Products (U) Ltd	
Tumwebaze K. Godwin	Director of Production
Family Choice Ltd	
Sebadduka Suubi David	Managing Director
Nyakahita Ghee	
Esther Byentaro	Manager
INKA	
David R. Bigira	Chairman
Mr Kafureeka	Treasurer
West Uganda Dairy Association	
George Nuwagira	Chairman
Ntungamo Dairy Farmers Coop Union (NDA FCU)	
Polly Matsiko	Chairman
Christopher Komire	Vice chairman
Capt. Byamugisha	Secretary
Rubare Dairy Centre (under NDAFCU)	
Stella Mateeka	Chairperson
Mr. Batondana	General Secretary
Mr. Julius	Milk assistant
Rubare Farmer Group Interview	
Mr. Kafuko	Dairy Farmer
Mr. C. Mugarura	Dairy Farmer
Mr. J. Byaruhanga	"
Mr. William Mwine	"
Hunter Supermarket / Kabale Tukore	
Mike Agaba	Sales Assistant
Banyakigezi	
Canon J. Batuma	Chairman
Productive Resources Investment for Managing the Environment PRIME/West	
Jim Seyler	Chief of Party
Kingsley Bash	Deputy Chief of Party
Rukungiri/Kanungu Dairy Farmers Coop. Society	
Canon Beyongyera	hairman
AI Technicians (Bushenyi)	
George Nuwagira	Manager
Daudi Mujuni	Technician / Inseminator
Bushenyi Farmer	
Kibanda Phinehas	Owner
Bushenyi Dairy Industry Cooperative Union (BUDICU)	
Makaaru Yoasi Rwamanga	Chairman
George Nuwagira	Member
----------	Treasurer

Uganda National Dairy Farmers Association (UNDFA)
Makaaru Yoasi Rwamanga Chairman
SAGRICON
Suleman H.O. Okech Director

Ankole Dairy Products Company (ADP)
Cyprian Rwegulo Technician
Esther Komuhangi Milk Assistant
Geoffrey Kyarimpa Accountant
YWCA Farmers Group, Mbale
Catherine Wakhole Chairperson
Jane Nasimolo Secretary
Florence Mukhwana Treasurer
George Weyawo Member
Rev. James Kangala Member
Musa Wamalugu Co-opted Member
Ruth Ongodia Extensionist
Waniaye Jawaali Sustainable Agriculture Extensionist
Bugusege Womens Livestock Group, Mbale
Jane Magombe Chairperson
Paul Magona Board Member
Silver Mukayaga Board Member
Harriet Mudebo Board Member
Catherine Namuwenge Secretary
Haluna Masaba Dairy farmer
Kongunga Womens Group, Kumi
Florence Okia Chairperson
Michael Okwi Extensionist
Charles & Helen Olemukan Farmers
Gaudesia Okurut Treasurer
Hellen Ojon Committee Member
Umoja Womens Group, Pallisa
Otule Ikiring
Otim John
Arikod Nicholas
Jennipher Ochilameri
Rose Kasabi
Angela Anyanget
Grace Onyege
Gorret Byakuwaba Secretary/farmer
Grace Abaet Treasurer/farmer
Hellen Anyait Chairwoman
Bugiri Dairy Farmers Association
Fred Kabi Extensionist
Babi Kassim Chairman
Ouma Ibrahim Vice Chairman
Buyinza Gad, David Kundu, Okumu Basiliano, Isabinje Malijam, Bindra Rita –farmers preparing to receive heifers
Buwunga South Bugiri Development Association
Oundo Ogutti Chairman
Odwori Simon Peter Vice Chairman

Bwireh Okumu	Secretary
Perusi Onyango	Treasurer
Wereh Raphael	Assisstant Secretary
Beatrice Odunga	Member
Nasota Masinde	Member
White Nile Dairies, Jinja	
Mr Shivaji Desai	Production Manager
Mr Abdulkadir Zakariah	Accountant
Gulu District	
Dr Okidi Ocan	District Veterinary Officer
Ms Margaret Odwar	Chairperson, Gulu Women Farmers Association
Ms Josca Otto	Vice chairperson, Gulu Women Farmers Association
Mr Walter Kola Kora	Secretary, Gulu Women Farmers Association
Ms Doreen Okumu	Treasurer, Gulu Women Farmers Association
Ms J Oda	Committee Member, Gulu Women Farmers Association
Mr Ochira Andrew	Committee Member, Gulu Women Farmers Association
Mr Vicent Ojok	Committee Member, Gulu Women Farmers Association
Mr Opiga	Committee Member, Gulu Women Farmers Association
Mr Amos Lakidi	HPI Public Relations Officer, Northern Region
Dr Michael Otim	HPI Extension Services Supervisor, Northern Region
Mr Komakech	GWDFA/MAAIF Project Extensionist Staff
Mr and Ms Edisa Langor	Aywee Village, GWDFA, Municipality
Ms Rose Atonga	Iriaga East Village, COU HPI Project, Municipality
Ms Molly Ochan	Aywee Village, GWDFA, Municipality
Ms D Okumu	Kirombe Village, COU HPI Project, Municipality
Mr Peter Riono	Laroo Obia Village, COU HPI Project, Municipality
Lt Col. Walter Ochora	Gulu District LC5 Chairman
Rev'd David Onyach	Diocesan Secretary, and Patron COU HPI Project
Rev'd Apollo Moroto	Chairperson, COU HPI Project, Municipality
Mr Okia Santo	Secretary, COU HPI Project, Municipality
Ms Sulina Akech	Member, COU HPI Project, Municipality
Mr Onasmus Ongwech	Member, COU HPI Project, Municipality
Ms Perisi Watmon	Member, COU HPI Project, Municipality
Ms Sabina Onono	Member, COU HPI Project, Municipality
Ms Christine Owinyi	Member, COU HPI Project, Municipality
Ms Martin Okello	Member, COU HPI Project, Municipality
Mr Mulare Vincent	Member, COU HPI Project, Municipality
Mr Francis Onyango Kani	Member, COU HPI Project, Municipality
Mr George Okech	Member, COU HPI Project, Municipality
Mr Alfons Opio	COU HPI Project Extensionist Staff
Ms Josephine Olanya	Chairperson, Patiko Bar Dege Women's Group
Ms Ajulina Menya	Vice Chairperson, Patiko Bar Dege Women's Group
Ms Grace Opita	Treasurer, Patiko Bar Dege Women's Group
Ms Grace Acaye	Secretary, Patiko Bar Dege Women's Group
Mr and Ms Marceline Opiro	Negri Farm, Patiko Bar Dege Women's Group
Mr Erica S.A Layoo	Mican Village, Bar Dege COU HPI Project
Mr Fred Okullo	Patuda For God, COU HPI Project, Municipality
Ms Christine Abur	Customs Corner, COU HPI Project, Municipality
Mr George W Okot	Customs Corner, COU HPI Project, Municipality
Ms Or-Sula Oriang	Lacor Village, COU HPI Project, Municipality
Ms Marceline Olango	Negri Farm, Patiko Bar Dege Women's Group

Wakiso District	
Mr Joseph Muhame	HPI Extension Officer, Kirinya Heifer Project
Ms Milly Susuume	Chairperson, Cattle Milk Committee, KHP
Ms Olivia Serunjogi	Committee Member and Farmers, KHP
Ms Jane Kawuma	Committee Member and Farmers, KHP
Ms Esther Kawuma	Committee Member and Farmers, KHP
Ms Agnes Balikudembe	Farmers and Member of Kirinya Heifer Project
Mr James Mujumba	Farmers and Member of Kirinya Heifer Project
Mukono District	
Mr Simon Salongo Lugolobi	Chairman, Nabuka Dairy Cooperative
Mr Paul Kintu	Board Member, Nabuka Dairy Cooperative
Ms Nakitto	Farmers, Agip Zone, Municipality
Mr Kabuye	Farmers, Colline Zone, Municipality

APPENDIX 4: FIELD VISITS

The Tables in this appendix show the field visits which were made by the evaluation team

Dairy Consortium Evaluation: Northem and Central-Northern Field Visits

Location	Client	Description	Consortium Assistance
Gulu district	Patiko Bar Dege Womens Group	Met with LC5 chairman and DVO. Had discussion with Board members, farmers and visited several farms	
Gulu District	Church of Uganda Gulu Heifer Project	Started by HPI in 1982. Met with group officials, visited farmers in a major milk deficit area	
Gulu District	Gulu Womens Dairy Farmers Association	Met with Board members who include retrenched soldiers, and visited individual farms. Seriously struggling to start bulking in a deficit area	In-calf heifer scheme. Training in natural resource management and sustainable agriculture. Biogas use. Access to improved genetics through AI
Nakasongola/ Luwero	Future Development Needs Assessment	Met DVO and Commercial Officer to discuss milk production/collection and herd management	

Dairy Consortium Evaluation: Eastern Region Field Visits

Location	Client	Description	Consortium Assistance
Jinja	White Nile Dairies	Medium-sized dairy processor producing pasteurized milk and yoghurt.	New product development, training in marketing, increasing plant capacity and quality processing.
Iganga	Kasolo Livestock & Housing Project	Met Extensionist/Vet & Chairman, farmers zero grazing & biogas units	Heifers from HPI, training
Mbale	YWCA Women's Project	Rural farmers engaging in dairy production and utilization of biogas.	In-calf heifer scheme, integrated farming through livestock development and biogas technology.
Sironko	Bugusege Women's Group	Women's group involved in milk production and milk bulking	Production training, cooperative development, milk handling and testing, business plan development, marketing.
Kumi	Kongunga Womens Group	Dairy farmers on mixed farms	HPI supported with heifers and training in production
	Aboka Akwap Group	Dairy farmers on mixed farms	HPI and extension support for production and management
Pallisa	Umoja Womens Group	Dairy farmers using zero grazing on mixed farms	Integrated farming methods, HPI training, extension assistance/inseminator
Bugiri	Bugiri Dairy	Dairy farmer group on mixed	Milk production and

	Farmers Association	farms	marketing
Bugiri	South Bugiri Development Assn.	Part of Bugiri DFA	Farmers preparing to receive heifers from HPI
	SOCADIDO	Milk bulking and value-adding	New product development, milk quality, and marketing.

Dairy Consortium Evaluation: Central Region Field Visits

Location	Client	Description of Visits	Consortium Assistance
Wakiso	Jesa Dairy Farm	Private dairy farm, AI training & semen from WWS	LOL streamlined cooperative formed by Jesa, trained group
Wakiso	Wamala Kageye Farmers Cooperative	Met farmers, saw zero grazing units, saw cooler	Cooler from HPI
Wakiso	Kirinya Heifer Project	Met project holder committee and several individual farmers. Project has built own office block, is bulking members' milk and ready to start making yoghurt	In-calf heifer scheme. Loan to buy a cooler. Training in bulking and business development. Access to improved genetics through AI.
Kampala	Uchumi and retail shops	Retail market for processed dairy products.	Promotions. Market development, market trends
	Metro	Retail Market for processed dairy products.	Promotions. Market development, market trends.
	Dairy Corporation Ltd.	Dairy processing plant.	Improved milk quality and testing at farm-level, supply linkages with farmers, market development, export development, participation in promotional activities, quality assurance, and new product development.
	Snowmans Group	Micro-processing of yoghurt and ice cream and leading supplier of dairy equipment.	New product development, sourcing of equipment and supplies, agency agreements, marketing.
	Kirinya Women's Group	Women's group involved in milk production, milk bulking and value-addition.	Production, cooperative development, management, business plan development, new product development, and marketing.
	Alpha Dairy Products (U) Limited.	Processing of past. milk and yoghurt and butter	Promotion Campaigns, market development, new products development.
	Paramount Dairies	Marketing Cheese, cream and yoghurt	Promotion campaigns, new products development, marketing
	Wamala Kageye	Milk bulking group	Production, cooperative development, marketing.
	Nabuka Dairy Cooperative	Farmer's group involved in milk production, milk bulking and value-addition. Met Chairman and some Board members, visited farms. Has cooler, is bulking milk, making yoghurt and has	Production, cooperative development, management, business plan development, quality improvement, and marketing.

		potential to make butter	
	AI Technician	Provision of commercial AI services.	Breeding and AI services.
	Quality Chemicals	Input supplier.	Public Private Alliance.
	Uganda Dairy Processors Association	Association of dairy processors established 2003	Lobbying with regulatory agencies in matters of mutual interests.

Western Region Field Visits

Location	Clients	Description	Consortium Assistance
Masaka	Masaka Diocese Development Organisation (MADDO	Farmers group involved in dairy production and currently venturing into value-added processing.	In-calf heifer scheme, micro-processing, business development.
	AI Technicians	Provision of commercial AI services.	Breeding and AI services.
Mbarara	Nyakahita Ghee	Rural, women-owned ghee microprocessor with strong market linkages to Kampala.	Value-added processing, business plan development, market expansion.
	Alpha Dairy	Dairy processing plants.	Improved milk quality and testing at the plant and at farm-level, supply linkages with farmers, market development, participation in promotional activities, quality assurance, and new product development. Public Private Alliances
	GBK Dairy	Dairy processing plants.	Improved milk quality and testing at the plant and at farm-level, supply linkages with farmers, market development, participation in promotional activities, quality assurance, and new product development. Public Private Alliances
	Family Choices Ltd	Micro Dairy processing	Training
	Ankole Dairy Products Company (ADP)	Milk bulking groups	Quality handling, milk bulking, management and business plan development.
	INKA	Milk bulking groups	Quality handling, milk bulking, management and business plan development.
	Western Uganda Dairy Association (WUDA)	Dairy Farmers Association	Formation, strategic planning, member services.
	SAGRICON	Business service provider	Capacity building.
Bushenyi	BUDICU	Farmer-owned milk bulking company supplying 15,000 ltr/day to Dairy Corporation. Membership of over 1,500	Farm-level training, breeding, cooperative development, business plan development, market

		farmers.	linkages, milk handling and quality, management and operations.
	AI Technicians	Provision of commercial AI services.	Breeding and AI services.
	Farmer	Dairy farmer member of BUDICU	-Training in milk handling: • Cooperative marketing • Herd improvement
Kabale	Banyakigezi	Milk bulking	Farm-level training, breeding, cooperative development, business plan development, market linkages, milk handling and quality, management and operations.
	Hunter	Processing yoghurt and cheese for Kabale market	Value-added processing, business plan development, quality improvement, and market expansion.
	Prime/West	New USAID Project. Has Dairy component	Plans to collaborate with LOL
Ntungamo	NDAFCU	Milk bulking	Farm-level training, breeding, cooperative development, business plan development, market linkages, milk handling and quality, management and operations.
	Rubare Dairy Centre	Milk bulking	Farm-level training, breeding, cooperative development, business plan development, market linkages, milk handling and quality, management and operations.
	Group of Dairy Farmers	Members of Rubare Dairy Centre	- Training in milk handling - Herd improvement - Record keeping
Rukungiri	Rukungiri / Kanungu Dairy Farmers Coop. Society	Milk bulking	None yet

APPENDIX 5: HUMAN POVERTY INDEX

Distribution of human poverty index (HPI) by region and by rural-urban location, 2000

Location or Region	Not expected to survive to age 40 yrs, %	Illiteracy rate, %	Without access to safe water, %	Without Access to Health care, %	Children moderately under weight, %	Regional HPI		
						1996	1998	2000
Rural	44.2	41.0	49.0	31.0	23.6	43.0	36.9	40.3
Urban	35.3	13.0	13.0	4.0	12.4	20.6	19.8	25.0
• Central	38.2	23.0	49.0	20.0	19.9	31.2	29.1	31.5
• Eastern	39.9	41.0	34.3	26.0	22.5	40.0	33.9	37.1
• Northern	47.1	54.0	34.9	35.0	25.0	45.7	39.4	46.1
• Western	46.8	35.0	42.0	30.0	23.7	39.3	36.3	39.0
Uganda	42.9	37.0	43.0	26.0	22.8	39.3	34.0	37.5

Source: Uganda Human Development Report, UNDP 2002

APPENDIX 6: Influence of rate of rebreeding on creditable annual milk sales per cow

Pregnancy after calving (days)	Calving interval (days)	Credit per year (%)	Lactation Milk (kg)		
			4,000	5,000	6,000
86	365	100	4,000	5,000	6,000
115	395	92	3,680	4,600	5,520
145	425	85	3,400	4,250	5,100
175	455	80	3,200	4,000	4,800
205	485	75	3,000	3,750	4,500
235	515	71	2,840	3,550	4,260
265	545	67	2,680	3,350	4,020
295	575	63	2,520	3,150	3,780

APPENDIX 7. Distribution of heifers purchased by HPI using USAID funds

District	Project Name	Heifers given	No of POGs	Calvings		Avg Milk Yield, l/d	Deaths	
				Males	Female		Calves	Cows
Gulu	Gulu Women's Dairy HP	51		23	22	9	7	3
	Patiko Bar Dege	13		7	3	9	1	3
	CoU Gulu Heifer Project	38		15	10	9	3	2
	Total	102		45	35	9	11	8
Masindi	Bulyasojo Women's HP	52	8	31	17	14		2
	Bweyale Women's HP	31		15	15	12		4
	Total	83	8	46	32	13		6
Apac	Apac Town Commun. HP	25		20	4	10		5
	Total	25		20	4	10		5
Lira	Adyel Widows & Orphan HP	27		15	10	15		4
	Boke Women's HP	21		9	9	13		6
	Total	48		24	19	14		10
Sironko	CERD	63		21	18	8		3
	Bugusege HP	62		24	15	11	2	1
	Total	125		45	33	10	2	4
Mbale	YWCA Mbale HP	68		26	16	13	4	6
	Abayudaya	50		22	17	11	1	2
	Total	118		48	33	12	5	8
Kumi	Kongunga	23		6	6	9	2	2
	Aboka Akwarp	60		23	18	13	1	2
	Total	83		29	24	11	3	4
Pallisa	UMOJA	65	2	23	25	9	2	2
	Sindanyi	59		6	12	10		1
	Kakoro	27		12	9	7	1	
	Total	151	2	41	46	9	3	3
Bugiri	Bugiri Dairy Farmers	36		12	12	12	2	2
	South Bugiri	45		16	20	15	2	
	Total	81		28	32	14	3	2
Iganda	Kasolo Livestock	94		51	26	14	4	6
	Total	94		51	26	14	4	6
	TOTAL DISTRIBUTIONS	910	20	377	284	12	31	56

POGs = Pass On Gifts

APPENDIX 8: Partial list of HPI and WWS published training brochures and record keeping formats

HPI	Title
1	Common Conditions of Cattle Under Zero-Grazing Management
2	Selected Topics on Dairy Management
3	A Guide for Using the Cow Lifetime Card
4	Woodlot and Fodder Establishment and Management
5	Common Diseases and their Control in a Zero Grazing Unit in Uganda
6	Clean Milk Production and Hygiene
7	Cow Reproduction in a Zero Grazing Unit
8	Feeds and Feeding on a Zero Grazing Unit in Uganda
9	Training Syllabus for Zero Grazing in Uganda
10	User's Guide: Compost Preparation and Application
11	Emmere N'endisa mu Kiyumba
12	Ebyokuzaala Kw'ente mu Kiyumba
13	Introduction to Family Planning
14	Eby'okulya N'endisa Y'ente omu Kibanda
15	Ebyokuzaara kwente omu Kibanda
16	Multipurpose Trees: Their Uses, Establishment and Management
17	The Importance of the Zero Grazing System in Environmental Protection in Uganda
18	Zero Grazing Shed for Uganda: A Guide to Shed Construction
19	Biogas (Bayogasi)
20	Ennyingo za HPI ku lwenkulakulana etuukiridde eya namaddala
21	Empagi narishi emyomyo za HPI ahabwazima nentunguka
22	Ekyoma ekiri kukora (omuriro) amasanyalazi kuruga omurwoya lwamasha nebindi bizunde
23	Omukka oguva mubintu ebiba bivunda
24	Cow Lifetime Card
25	Dairy Goat Lifetime Card
26	Buck (Male Goat) Lifetime Card
WWS	
1	Good Hand Milking
2	Cattle Judging
3	Calf Rearing
4	The Fertility of the Dairy Cow
5	Fodder Tree Management
6	Dairy Record Book
7	How to Get Best Breeding Results
8	Heat Expectancy and Gestation Chart
9	The Simplified Herd Recording Scheme
MAAIF	
1	Farmer's Service Record Card
2	Daily Milk Production Record
3	Milk Disposal Record
4	Farm Input Record