



FINAL REPORT
SEPTEMBER 2002-APRIL 2008

USAID Agreement Number 623-A-00-02-00097-00



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July 2008

Land O'Lakes, Inc.

DAIRY DEVELOPMENT FOR KENYA

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Dates of project: Sept. 17, 2002 – April 30, 2008

Total estimated federal funding: \$8,322,966

Total federal funds obligated: \$8,322,966

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Land O'Lakes, Inc.**DAIRY DEVELOPMENT FOR KENYA****Agreement No. 623-A-00-02-00097-00****FINAL REPORT****FOR SEPTEMBER 2002-APRIL 2008****TABLE OF CONTENTS**

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A. EXECUTIVE SUMMARY

Land O'Lakes, in partnership with African Breeders Service Total Cattle Management (ABS-TCM), International Livestock Research Institute (ILRI) and World Wide Sires (WWS) East Africa, presents this final report for the Kenya Dairy Development Program (KDDP). The project's activities contributed to the achievement of several intermediate results under USAID/Kenya Mission's SO7 on "Increasing rural households income".

Key Highlights

This final report marks the end of the Kenya Dairy Development Program which began in October 2002. It brings to the end an era of key milestones and achievements that have revitalized the Kenyan dairy sector by enhancing efficiency and effectiveness of service delivery in the value chain with overall net economic benefit to smallholder farmers estimated at \$ **25,866,853**. The other key achievements over the program period are:

- Reached **144,728** farmers with direct training on good agricultural and best dairy herd management practices and technologies to increase clean milk production, achieving women participation of **35%**. Over **200,000** others benefited indirectly by participating in shows and exhibitions held countrywide.
- Enhanced cow productivity by **19%** among farmers in operational zones as result of adoption of high quality feeding regimes and modern breeding practices.
- Reduced cost of milk production by **16%** against target of **30%** over the project period. New fodder legumes such as Lucerne and Desmodium promoted by program have reduced smallholders' reliance on expensive commercial based concentrates.
- Pioneered and initiated **60 LFFS** as compared to the planned **50** by end of program. The LFFS have provided learning platforms for widespread technology adoption by farmers achieving over **50% increase in cow productivity**.
- Facilitated sale and utilization of **239,858** doses of imported US bovine genetics, impacting on **91,549** farm households verses the program's target of **87,000**. Some cows upgraded through the program initiatives have achieved **over 38 lts** per day against the national average yield of about **5 lts**.
- Identified and supplied over **21 new** validated technologies that have met and exceeded expectations of dairy stakeholders. Elite semen technologies such as **sexed-semen** have increased heifer conception rates to **99%**.
- Provided capacity building for **1767** new commercial service providers in the targeted zones, exceeding the set target of **1700**. The BDS providers have enhanced farmers' access to reliable and efficient dairy support services with clear exit points for KDDP.
- Key milestone as the program launched the **Milk Quality Assurance** services complete with new milk technologies to improve milk quality along the chain. Stakeholders adopting the system have recorded major economic gains as a result of adoption of GAP and GMP.
- Facilitated rehabilitation and installation of milk coolers with capacity of **over 56,000 lts** in **15** coops. Improved cold chain management has enhanced economic benefits due to increased intakes and reduction in spoilage and rejects.
- Realized **109% and 160%** increases in volume and value of trade in dairy products respectively in targeted cooperatives over the project's lifetime. KDDP training emphasized efficient service delivery to member farmers.
- Promoted adoption of NRM technologies by **over 700** farm families contributing to sustainable management of the dairy enterprise.
- Disseminated **over 130,000** bulletins, journals and education materials to enhance best dairy practices in the value chain. Farmers' demand and utilization of timely dairy information has increased exponentially over KDDP lifespan.

- Developed and disseminated the **Dairy Toolbox, Targeting tool and Feeding Manual** to **over 500** extension personnel, farmers and institutions to provide information on best dairy husbandry practices. The Toolbox is a one stop shop for information and decision support.
- **Advocated for and influenced the harmonization of AI syllabus** and licensing of private sector trainers and trainees. KDDP has persistently negotiated for and supported private sector led development in the industry.
- Collaborated in the development of **new Dairy Development Policy** unveiled by the Ministry of Livestock and Fisheries in April 2006. KDDP supported various studies on recognition, monitoring and certification of the informal milk market segment, which are key tenets of the bill.
- The protracted violence stemming from the December 2007 disputed presidential elections disrupted milk production, collection, distribution and marketing in major parts of Rift Valley Province, Western Kenya and Nairobi. A rapid assessment undertaken by Land O'Lakes to quantify its impacts on the dairy value chain disclosed that the industry lost an estimated **Kshs. 7.437 billion** in the months of January and February 2008, following the outbreak of the violence. The losses were attributed to farmers' loss of dairy animals; losses in milk sales; losses by service providers, input supplies companies and dairy processors; and consumers and producer losses due to increased costs. Land O'Lakes spearheaded a dairy stakeholder meeting in February 2008 to discuss the impacts of the post election violence on the dairy industry and map way forward for response. The forum marked the first meeting by all players in the industry to discuss the post election violence.

B. INTRODUCTION

Goal and Objectives

The program goal was to significantly increase the economic benefits to stakeholders in the dairy value chain and to improve rural household incomes. The approach was to improve milk and dairy product demand, industry efficiencies and farm-level productivity throughout the dairy system.

The consortium's objectives were four-fold:

- ❑ To increase demand for quality dairy products through aggressive promotional campaigns to expand domestic and export market demand;
- ❑ Improve processors' and informal marketers' ability to deliver higher-quality, safe, affordable products to the marketplace;
- ❑ Enhancement of productivity at the farm level of smallholder dairy households through delivery of effective services; and
- ❑ Create sustainable local capacity of businesses, co-operatives and enterprises to provide services demanded for improvements in market expansion, cost competitiveness and productivity.

An over-arching focus during implementation of these objectives was to encourage greater participation by women in all aspects of business through the dairy value chain and critical awareness of utilizing natural resources sustainably while developing the industry.

Project Support of USAID SO7

KDDP consortium interventions sought to impact on the USAID Strategic Objective 7.0 on "Increased Rural Household Incomes" and the following Intermediate Results (IR):

IR 7.1 - Increased productivity

The sub-intermediate results that KDDP sought to deliver on are:

- ✓ Increased productivity of targeted agricultural sub-sectors
- ✓ Policy environment promoting investment in agriculture and efficient use of resources
- ✓ Increased use of technology
- ✓ Sustainable use of natural resources for agriculture

IR 7.2 - Increased agriculture trade

The sub-intermediate results being:

- ✓ Increased agricultural trade in domestic, regional and international markets
- ✓ Improved performance of agricultural marketing systems
- ✓ Improved services for agricultural trade

IR 7.3 - Increased Access to Business Support Services for Micro and Small Enterprises

The sub-intermediate results under this IR include:

- ✓ Non-Financial Services Delivered Cost-effectively

IR 7.4 - Increased effectiveness of smallholder organizations to provide business services to their members and represent the business interests.

Geographic Focus and Target Groups

To ensure that USAID-allocated resources to the program were utilized to capture the greatest rates of return on investment, the Land O'Lakes consortium targeted geographic areas of high and medium agro-ecological characteristics, best suited for milk production. The program used a Geographical Information System (GIS)-based information tool developed by ILRI, a series of maps that guide selection of geographic areas based on agro-climate, cattle populations, combined with detailed information on road infrastructure, milk market points, human populations and urban centers, to target the dairy interventions.

Over its lifetime, KDDP focused its activities in the following districts: Muranga, Kiambu, Nyandarua, Nyeri, Nakuru, Bomet, Kakamega, Kericho, Kirinyaga, Laikipia, Migori, Muranga, Nairobi, South Nandi, TransNzoia, and Uasin Gishu.

Together, the Land O'Lakes/KDDP consortium members comprised an impressive industry network of input suppliers, individual farmers, farmer groups, co-operatives, small-medium-large processors, informal marketers, service providers, dairy industry groups, government offices, and donors. The industry networks were involved in the program either as recipients of development assistance and/or as lending support and services to ensure program success.

Key Activities and Implementation Strategies

The interventions under KDDP were grouped into four broad areas, namely; activities for enhancing dairy productivity; policy advocacy activities; dairy product quality and affordability activities; and dairy industry capacity-building activities.

C. PROGRAM ACHIEVEMENTS

Table 1: Actual Performance on Key indicators under Kenya Dairy Development Program

Intermediate result: 7.1 Increased Productivity of Targeted Agricultural sub-sectors				
Indicator	Baseline	April 2008		Remarks
		Target	Actual	
% change in annual productivity	8.6 lts /cow/ day	40% increase (equivalent to 12.04 lts/cow/day)	19% equivalent to 10.25 liters per cow per day.	While overall gains in productivity are low due to droughts. Some targeted cooperatives and farmer field schools achieved over 50% increase in productivity due to aggressive adoption of better feeding regimes and husbandry practices promoted by program.
% reduction in the cost of production per unit of output	Kshs. 13.35 (equivalent to Kshs. 16.25 if inflation is considered)	30% reduction in cost of production (equivalent to Kshs. 9.35)	16% equivalent to Kshs.11.15 , (is equivalent to over 30% if increase in prices over the years is factored in)	Spiralling increases in costs of inputs due to post election violence has undermined gains made in productivity. However, some cooperative have achieved over 30% reduction in cost of milk produced.
Sub-Intermediate Result: 7.1.2 Increased Use of Technology				
Number of farmers using KDDP improved technologies	0	87,000 farmers (equivalent to 227940 straws of US bovine genetics)	91,549 farmers, (equivalent to 239,858 straws of US cow genetics)	Targets exceeded. Program enhanced farmers' accessibility to reliable and efficient AI services by training of service providers and facilitating establishment of AI service points. Elite semen technologies introduced by program such as Gender sexed semen have increased conception of heifers to 99% .
Sub-Intermediate Result: Sustainable Use of Natural Resources for Agriculture				
Number of farmers using Natural Resources Management technologies	0	700	710 farmers adopting NRM technologies	Targets exceeded. Results of on-farm Lucerne trials already disseminated to dairy stakeholders for up scaling of adoption. ToT approach to biogas technology pays off as many farmers adopt tubular biogas units. Adoption of biogas units has reduced farmer's expenditure on fuel and environmental degradation.

Intermediate Result: 7.2 Increased Agricultural Trade in Domestic, Regional and International Markets				
Increase in agricultural trade in processed dairy products	133,100.5 (,000 lts)	33% increase in volumes traded nationally.	36% increase in volumes traded nationally.	Targets exceeded. Program carried out retail audits to gauge increases in volume traded as a result of generic promotion campaigns but discontinued in 2005 following mid-term evaluation.
Increase in value of agricultural trade in dairy products.	Kshs. 6184.96 (million)	33% increase in value of locally traded processed dairy products	37% increase in value of nationally traded dairy products.	Targets exceeded. Program carried out retail audits to gauge increases in volume traded as a result of generic promotion campaigns but discontinued in 2005 following mid-term evaluation.
Increase in volume of trade among KDDP targeted cooperatives (Milk intake in Kgs)	25,088,202 Lts	33% increased in milk intake	109% increase in milk intake (Equivalent to 52,461,700 lts) in 2007.	Targets exceeded. KDDP has enhanced service delivery in targeted cooperatives by providing capacity building for management committees. Farmers have also been equipped with skills to increase milk production.
Increase in value of trade among targeted cooperatives (Milk and dairy products sales) in Kshs.	Kshs. 389,603,438	35% increase in value of trade	160.5% increase in value of trade (equivalent go Kshs. 1,014,859,069) in 2007	Targets exceeded. The programs business linkages, cold chain management and value addition initiatives have expanded farmer groups' business revenues and environment.
Intermediate results: 7.3.3 Services for Agricultural Trade Improved				
The total number of new BSP participating in KDDP operational areas	0	1700	1767	Targets exceeded. Accreditation of private sector trainers in AI such as ABSTCM has enhanced access to quality training services. The service providers are envisaged to provide quality services on a sustainable commercial basis beyond the lifespan of KDDP.
Intermediate Result: Increased Access to Business Support Services for Micro and Small Enterprises				
The indicator tracks the number of micro and small enterprises (MSEs) acquiring program assisted commercial business services.	0	140,000 farmers trained over the project years	144,728 farmers imparted with technical skills on GAPs.	Targets exceeded. KDDP collaborator with a number of stakeholders such as MoLD and private sector players in organizing educative forums for farmers and service providers. Over 200,000 others reached indirectly through trade fairs, shows and exhibitions over the project period.

Intermediate Results 7.1: Increased productivity of targeted agricultural sub-sectors

The program interventions under this IR focused on addressing the challenges hampering increased productivity among smallholder dairy farms in targeted areas. Activities emphasized capacity building to impart appropriate skills and knowledge to farmers on good animal husbandry practices, appropriate feeding regimes, fodder production, feed formulation and conservation by silage making to combat seasonal fluctuation in milk production. KDDP collaborated with key stakeholders such as Ministry of Livestock and Fisheries Development (MoLFD), dairy processors, other NGOs and animal feed manufactures, in organizing and facilitating learning platforms for farmers and commercial service providers. The network of collaborators will ensure continuation of the activities beyond the lifespan of the project. The segment below details the projects achievement on productivity indicators and some of successful productivity-enhancing activities undertaken over its lifetime.

- Cow productivity in targeted areas increased by **19%** to **10.25 lts per cow/day** over the program period. Although this represents productivity during the months of January and February 2008 covered by the current survey are relatively drier, the program recorded the highest gain of **26%** in Jan 2007. Farmers in some targeted areas also cited inability to access hay during the period covered by the present survey due to protracted post election violence in major hay producing areas in Rift Valley Province. Despite the low overall gains in productivity due to severe droughts experienced in 2004 and Oct' 05-April '06, **25.8%** of farmers in project zones registered gains in yields way above the targeted **12.04 lts** per cow/day. Some targeted cooperatives such as Masii and Wamunyu where farmers aggressively took up KDDP's feeding and husbandry practices achieved over **50%** rise in yields. Evidence from independent impact assessments done on **10** KDDP-initiated farmer field schools indicates productivity increases of between **50-100%**. Over the same period, calving interval reduced by **days** as a result of more efficient AI delivery services established by project.
- KDDP promotion of adoption and use of new leguminous fodder technologies bore fruit as cost of milk production is reduced by **16% to Kshs. 11.15** (a reduction of **31%** if price increases over the project years is considered). The adoption of the high crude protein and palatable *Lucerne* and *Desmodium* fodder species have significantly reduced farmers reliance on expensive cereal-based commercial concentrates such as dairy meal. The recorded **12%** increase in cost of production between August 2007 and Jan/Feb 2008 is attributed to spiralling increases in input prices as a result of post election violence. A survey of sample farmers in operational zones also indicates that **86.5%** are keeping records of some aspects of their dairy enterprise.
- The program consortium collaborated with key industry stakeholders in organizing and facilitating capacity building of farmers in various forums such as field days, seminars and workshops since its inception in 2002. These forums covered aspects such as fodder and forage production, on-farm demonstration on silage making, appropriate feeding regimes and good agricultural practices including clean milk production and modern breeding techniques. A total of **144,728 farmers** benefited directly from the program outreach activities over its lifespan whereas over **200,000** others were reached indirectly in shows and exhibitions organized countrywide. Women participation in program activities averaged **35%** over the program period.
- KDDP pioneered the concept of *community dairy livestock shows*. The second ever community show was held at Wiyumiririe Primary School in Nyala on 7th December 2006. The highly successful event was a culmination of several years of KDDP's work with the Nyala farmers. It showcased the community's achievement in dairying and enhanced business linkages with other stakeholders in the sector. The show sponsored by private sector players such as Sigma Feeds and Twiga Chemicals Ltd, attracted over **30** private exhibitors and over **8,000** farmers.



Development of ICT-Based Technology for feed formulation

Land O'Lakes organized a series of feed formulation workshops for feed millers, extension agents, farmers, commercial service providers and animal nutrition researchers on use of ICT-based tool for feed formulation. The activity was initiated through collaboration with volunteer consultants from University of California Davis obtained through USAID-funded Farmer-to-Farmer program administered by ACDI-VOCA. It was then that KDDP started developing an ICT-based tool for Kenya.

The software is designed to formulate feeds based on the following principles: Target milk production; Cost of feeder per kg/ton; Cows body weight; and recommended nutrition for the cow, given the targeted milk production. Using the above parameters, the most cost effective and nutritious ration can be prepared for whatever feed components that are available.

Land O'Lakes entered into a MoU with UC Davis to avail feed formulation software tools to Kenyan livestock farmers under KDDP. This effort has culminated in the development of ICT-based tool, PC Dairy program, customized for use in Kenya through collaboration with scientists from Kenya Agricultural Research Institute/University of Nairobi.

KDDP has provided capacity building for farmers groups and service providers to enable them utilize the software as an extension tool to improve feed quality and feeding practices. Over **3,000** farmers and service providers have been trained on the use of tool while two cooperatives, Wakulima SHG and Githunguri DFCS, with active membership of over **9,000** farmers have installed the feed formulation

software and are offering the service to their farmers. These farmer groups join Agricultural Development Cooperation (ADC) which recorded a **13.6%** (net incremental annual benefits of **Kshs. 150,000**) increase in herd production at their Namandala farm as a result of training and adoption of use of the technology.



The late Prof. Monte Bell (right), who introduced the UC Davis Feed Formulation Software, PC Dairy, to KDDP, at a demonstration seminar at Land O'Lakes offices in Nairobi.



Feed formulation Workshop in Wakulima DFCS using the PC dairy program (pic J. Kirui, Land O'Lakes).

The Feed Quality Analysis Laboratory

Another key achievement in the program period was the completion of installation, calibration and performance testing of the **feed analyses laboratory equipment** by Team ABS TCM. The completion of laboratory installation led to collaboration between dairy industry stakeholders including private nutrition service providers, feed millers and cottonseed ingredient suppliers. The consortium member collaborated with Kenya Agricultural Research Institute (KARI) to analyze KARI feed samples (from their feed samples bank) for calibrations of the NIR machine to local samples and with Kenya Bureau of Standards (KEBS) for laboratory proficiency testing and accreditation. Dairy processors and feed millers welcomed the installation of the laboratory and some have begun using chemical composition of feed ingredients as a basis to negotiate purchase price and to optimize their ration formulations. The feed analysis laboratory is capable of a sample turn-around time of **48 to 72** hours after receipt of sample.

The launch of the feed quality testing services integrates into the program goal of ensuring use of good quality feeds for high quality milk production. Poor feed quality, especially from feed millers, has been a major concern in the Kenyan dairy sector. It is envisaged that increasing farmers' awareness on feed quality and the launch of feed analysis will contribute to high feed quality standards in the industry. **Over 400** feed samples from project target areas have been analyzed, interpreted and farmers advised on best feeding strategies. Farms adopting the services have recorded a **60%** increase in milk production as a result of optimally formulated rations.

Partner ABS TCM continues to work on accreditation requirements through the Kenya National Accreditation Scheme (KENAS) under Kenya Bureau of Standards (KBS). Laboratory analytical procedures and standard operating procedures (SOP) manuals were presented to KENAS for review.



Technicians prepare feed samples for analysis at the newly installed feed analysis laboratory at ABS TCM.

Assessment, Training and Demonstration of Farmer Field Schools

KDDP through ILRI and Land O'Lakes had the mandate of building capacity and laying foundation for implementation of Farmer Field Schools Methodology (FFS) by adapting it and piloting it in the dairy sub-sector. The FFSs have been described as "a school without walls" because it brings together farmers with common problem to seek own solutions guided by a trained facilitator. They are participatory learning platforms where community members gain better decision making and technical skills through involvement in specific dairy activities.

KDDP pioneered and facilitated the establishment of **60** livestock farmer field schools against a target of **50**. To ensure sustainability of the LFFS, KDDP has networked and strengthened partnerships between these emerging institutions with MoLFD and FAO. The program also trained and maintained livestock personnel who can understand and upscale the approach by conducting ToTs for **24** Master Trainers. In this final project report, we present a second impact assessment undertaken to examine the changes in management practices, productivity and incomes of smallholder dairy farmers and gender dynamics as a result of participation in the FFS. A summary of the first assessment can be obtained from the program's annual report for 2006-2007. With average membership of **30**, nearly **1,800** farmers have been reached through the FFS. And with each FFS member reaching out to five other farmers in the community, nearly **10,000** farmers have been reached directly or indirectly over the program years.

An appraisal of the impact of Livestock farmer field schools (LFFS) on dairy production

The objective of this follow-up survey was to determine the influence of participation in FFS activities on farmer adoption of various dairy technologies and hence productivity of the dairy cows. Having had the FFSs for a number of years, the study would also provide useful information on the sustainability of these emerging farmer groups.

Eight FFS's in Nyeri, Nyandarua and Nakuru Districts were purposefully selected for this study. The selection was based on the fact that they had remained relatively stable, and were thought to have been relatively less affected by the post election crisis. They all comprised smallholder crop-livestock farmers. Using a two page structured questionnaire, individual interviews were conducted with **ten members** of each group selected at random. The parameters chosen for investigation before and after joining FFS were: Milk yield per cow-peak milk production was used as is easier for farmers to recall; Reproductive performance – to be determined by last calving and service dates as obtained through farmer recall; Adoption of various improved fodders and if possible acreage or number of trees and; Adoption of various dairy management technologies.

Effect of joining FFS

Dairy practices

Interviewees disclosed learning a wide range of dairy technologies but the most popular among all the FFS's were calf rearing, fodder establishment and preservation, clean milk production and feeding. These are the issues regarded as critical to the dairy enterprise irrespective of the feeding system practiced. Popularity of other topics seemed to vary most likely depending on the priority problems identified by individual FFS's. Housing did not seem to be as popular as it is expected and this may be due to the fact that very few farmers practiced zero-grazing. Despite the fact that **96%** of the sampled farmers adopted record keeping after joining FFS, the topic did not seem to be as popular. Adoption rates of the various technologies ranged from **25%** to nearly **99%**. The first assessment recorded technology adoption rates of more than **50%**.



Members of Amboni LFFS at a learning session at Amboni in Nyeri district (pic by A. Kavatha, Land O'Lakes, Inc.).



Members of Mwhoko FFS in Nyeri display their certificates during their graduation (Josephine, Land O'Lakes, Inc.).

Establishment of Lucerne/Alfalfa - Lucerne is popularly referred to as the "King of legumes". Before joining FFS only four of the farmers interviewed had Lucerne on their farms and most of them had very little information about it. At the time of this study 89.3% of the farmers had established Alfalfa. The study confirmed adoption rate increased from 5.3% to 89.3%.

Milk Yields

The milk yields were generally low for the type of breeds of dairy cows kept. Nevertheless all the farmers interviewed had experienced increases in milk yields ranging from **28.2% to 64.4%** with overall average increase of **49.6%** (see table 2 below). This increase can be attributed to increased knowledge in improved dairy technologies acquired during trainings and which translated to better feeding in terms of quality and quantity of rations and an improvement in other management practices. Most of the yields given were for the same cow(s) before and after joining FFS, with an assumption that even with a different cow, the yield was likely to be more or less the same given the same level of management. Gikumbo FFS registered the lowest milk increase but this may be attributed to the small (n = 4) sample size.

Table 2: Changes in average peak milk production per cow in Kg

Name of FFS	Average milk yield before joining the FFS (Lts)	Average milk yields after joining the FFS (Lts)	Average increase in milk productivity (%)
Bimu	4.2	10.7	60.5
Chuma	6.4	14.3	55.7
Gikumbo	7	9.8	28.2
Kihara Lucky	5.5	9.9	44.4
Kirima	3	6	50.5
Ng'ombe	3.4	9.7	64.4
Olkaka	5.9	9.8	39.3
Ramaki	6.4	14.2	54.8
Mean (all)	5.4	10.7	49.6

Source: KDDP Survey, 2008.

The results of this study showed much lower milk yield increase as compared to the results of an earlier study conducted in Nyeri District, which showed increases of over **100%** (KDDP, 2007)¹. However, this may attributed to several factors such as differences in Agro-ecological Zone (AEZ) in which the FFS's are located, grazing systems and milk marketing system.

Other benefits of joining FFS

Apart from issues to do with dairy farming, the respondents used the FFS forum to exchange knowledge on other issues including other livestock enterprises, economic, social and even political issues. A number of FFSs have also formed a savings group from which members could obtain money to cater for their financial needs, and priority would be given to those with emergencies. Generally all interviewees acknowledged that FFS was an important forum for socialization and it improved on the peace and harmony in the area and had improved their general livelihood

Conclusion

FFS methodology empowers farmers to identify their problems and to come up with and test solutions that best suit them. Results of this study clearly indicate that after joining FFS all the farmers realized an increase in milk production although to varying degrees which can be attributed to improved dairy management practices. The assessment corroborates other findings that have shown that FFS is an effective and affordable tool for speeding up the uptake of improved technologies at community level, improving rural food security and income generation, and empowering farmers to find solutions to their livelihood problems.

This study also shows that apart from serving as a forum for solving farmer's technical problems, FFS also is an effective forum for addressing community social, economic and political problems which indirectly may affect the core purpose which in this case is dairy production. The fact that from the increased income farmers were able to pay school fees, meet other household demands and even purchase farm assets shows that establishment of FFS can have a direct positive influence on the livelihoods of rural communities. (Report attached)

¹ M. Lukuyu, 2007. An appraisal of the impact of farmer field schools (FFS) on dairy production among members of three FFS's in Nyeri district KDDP/Land O'Lakes, Kenya

Gender Dynamics in the FFS

Gender remains a key consideration under SO7 and was one of the areas singled out as needing further emphasis in program implementation following its mid-term review. As part of the programs undertakings on the FFS, we conducted an assessment of the dynamics of **Gender within the LFFS**. These gender aspects are believed to offer great opportunities for increasing productivity within the FFS.



The objectives of the assessment are:

1. To identify and understand the gender issues (or dynamics) arising in the different contexts in which of LFFS is being adapted within Kenya's smallholder dairy and agro pastoral production systems. Is LFFS process making a significant contribution in bringing about positive changes in gender roles/equity?
2. To carry out Gender Analysis of the primary technologies common in the LFFS (including any emerging differences in the technological needs of men and women within the LFFS).
3. Investigate the role of women and men in the development of LFFS and develop guidelines for utilizing gender capacities /roles to define research and learning activities in LFFS
4. Suggest ways of mainstreaming gender perspectives in the implementation of LFFS approach in smallholder settings

Results of the assessment

- There is gender in terms of social structure of age since the youth dimension came out strongly in terms of the opportunities and technologies. However, it was observed that few young women were involved in the FFS.
- FFS presented opportunities for family members, including women, to be involved in decision-making. In this sense, active participation in the LFFS is changing the gender roles by encouraging participatory decision-making. Women are empowered in decision-making in terms of the use of family income.
- The FFS is an avenue for exercising gender equality – both women's and men's views on technology, society and economics are equally listened to.
- Women are able to articulate technology needs better and have a say in what is adapted.

- In the development of FFS, significant behavioral changes are noted where the men are more at home helping the women with work hence, combined household labour.
- There are some gender effect differences emerging from regional differences, cultural and facilitation approaches.

While the FFS is not set up to address gender, its very nature influences gender patterns and relationships. The above observations and others were analyzed and synthesized into recommendations for the further development of the FFS as a gender friendly extension and development methodology.

Networking of FFS: As part of its exit strategy, KDDP embarked on strengthening and supporting the broader FFS platform in Kenya by linking with other development actors including FAO, government etc. Preparations were made to complete the handing over process of KDDP FFSs and linking them with key support institutions and the extension systems within their localities included the representation of KDDP in a meeting led by FAO and UNDP and involving a broad spectrum of organizations drawn from the FFS experience in Kenya (Govt, NGO's, Networks, farmers, researchers etc). This is a process designed to entrench longer term sustainability and maximize impacts of KDDP FFS. FAO agreed to facilitate a working group to coordinate all the disparate attempts to research, develop, mainstream and upscale the use of FFS in Kenya. Eventually it is hoped that graduated LFFSs can exist independently, operating as platforms for communities to widely access validated technologies and dissemination of materials that support farmer led extension.

Sub-Intermediate Result: 7.1.1 Policy environment that promotes investments in agriculture and efficient use of resources

Since its mid-term evaluation, the program's interventions have focused on changing the regulatory reforms that do not require parliamentary action through appropriate ministries. Tegemeo Institute of Technology is now handling the bulk of the policy advocacy component of all USAID-funded commodity projects.

a) Assessment of AI delivery system in the context of breeding services generally within the dairy sub-sector

KDDP, through its partner ILRI, had a lead role in the assessment of the Artificial Insemination (AI) delivery systems throughout the country. The assessments were response to information needs and provision of technical analysis to support and inform policy dialogues. The results of research carried out over the last few years have been fed into policy and development processes within and outside KDDP.

The following policy briefs have been prepared and circulated since program inception:

- The extent of inbreeding in smallholder dairy farms in Kenya.
- Artificial Insemination (AI) services in Kenya: implications of policy changes on a dynamic dairy sector in a developing country.
- Breeding services in Kenya: targeting for efficient service delivery.
- Factors determining the demand for dairy services in Kenya.
- The survival and success of smallholder dairy: making the right traits and breed choice.

Breeding Policy Forum

After a successful breeding policy forum organized by KDDP/ILRI and MoLFD (November 7, 2006) to discuss breeding policy, MoLFD formed a task force to review livestock and breeding policies in Kenya, drawing heavily from a series of studies supported by KDDP. ILRI staff and partners are involved in the breeding task force which is aimed at identifying policy and development recommendations to improve

cattle breeding services in Kenya. This will eventually lead to the formation of a Dairy Cattle Breeding Policy which is currently lacking in Kenya. The development of this policy is meant to provide guidelines and information to farmers, investors, researchers, extension workers and other stakeholders to help them identify breeds suitable for various agro-ecological zones and production systems; alternative breeding programs; trade in genetics materials; breeding and management systems for conservation and sustainable use of indigenous genetic resources and use of modern breeding techniques. The task force has prepared a draft policy which is being reviewed before being passed over to parliament for debate and enactment.



Group photo for the members of the breeding task force at its inauguration in April 2007. KDDP staff, Robert Ouma, is second from left.

b) GIS maps and report on effects of infrastructure and market policy on producers, market agents and consumers

The production and dissemination of the Targeting Guide marked the end of ILRI's work in providing information/tools that could be used to target interventions under KDDP and other dairy developmental projects.

Targeting is used here to mean predicting, using good information and scientific tools, areas where diffusion and adoption of dairy innovations would be successful. A methodical rather than an *ad hoc* approach is used to predict areas where probability of adoption is high and/or where potential impact of the innovation are highest. The goal of this activity is to help identify areas where dairy development interventions are more likely to be successful. ILRI produced a targeting guide to enable partners focus their dairy development interventions where they are most likely to achieve maximum effects. In addition the guide contains important discussion on the key policy and infrastructural issues in the dairy industry.²

The targeting guide contains maps detailing areas of recommendation for **12** different dairy technology interventions and market and policy areas as follows:

R. Ouma, L. Njoroge, D. Romney, P Ochungo, S. Staal, and I. Baltenweck (2006). Targeting dairy interventions in Kenya: A guide for development planners, researchers and extension workers. SDP/KDDP, Nairobi, Kenya

Production technologies <ol style="list-style-type: none"> 1. Improved Dairy Cattle 2. Zero-grazing 3. Concentrate Feeding 4. Napier Forage Development 5. Utilization of Crop residues 6. Forage legume development 7. Feed Conservation Innovations 8. Use of Acaricides 	Market and policy innovations <ol style="list-style-type: none"> 1. AI Services 2. Dairy Cooperative Development 3. Milk Preservation Innovations 4. Training & certification of milk traders
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The Guide employs both observation and criteria based approaches to arrive at conclusions as to the expected adoption rates.

c) Support development of program for certification and monitoring of informal milk trade

KDDP, via ILRI, pursued policy interests in development of the informal milk marketing sector by participating in the project on improving Quality Assurance in Milk Markets through Training and Certification of MSEs led by SITE (Strengthening Informal Sector Training and Enterprise). The liberalization of the Kenyan dairy sector had given rise to a largely unorganized informal sector and with no systems in place to check on quality and practices. KDDP's task has been to apply a combination of Outcome Mapping and Quantitative Techniques to monitor specific impacts of the training and certification in the informal sector. Below are the other project activities that were geared towards achievement of this objective.

Training Guides

Trainer and trainee guides for informal milk traders were developed collaboratively through a broad based public health committee that was set up at the beginning of KDDP. **Two thousand** copies of these trader guides and **500** copies of the trainer guides were printed and disseminated with KDDP partner Land O'Lakes, FAO, SDP and the Kenya Dairy Board.

Training of Traders

A total of **600** informal milk traders were trained by KDDP in collaboration with Smallholder Dairy Project (SDP), Ministry of Health, and MoLFD against target of 540. The milk traders were trained using the newly developed guidelines on use of alcohol tests and lactometers to screen for milk of good quality to ensure the public health concerns are addressed. After the training, the traders were issued with certificates which bore the KDB logo and signatures of senior KDB officials appear prominently on the certificates issued to these traders.

From the end of 2005 the work continued through ILRI collaboration in another DFID funded project 'Improving Quality Assurance in Milk Markets through Training and Certification of Medium and Small-Scale Enterprises (IQAM). The IQAM project uses the BDS (Business Development Services) approach and aims to contribute to institutionalization of the certification approach by establishing a cadre of service providers able to train traders in hygienic handling of milk. Certification of these small-scale traders by the KDB would be linked to this training. Monitoring of the activities of the certified milk traders during the first months led to a further round of recruitment with a more carefully targeted approach to selection of candidates to act as KDB accredited service providers. About **33** traders have been registered under the category to offer training and advisory services to small and medium enterprises in the dairy industry.

d) Policy Advocacy

The program's policy work in the breeding sector was geared at generating and providing information on breeding services and influencing policy reforms. The achievements in this arena either through program initiation and/or direct participation include:

- Harmonization of AI practitioners training curriculum where a joint curriculum was developed and practitioners trained by the private sector (including ABS and WWS) are now licensed. A key achievement was the **accreditation** of Team ABS as an authorized trainer of AI service providers.
- A government review of the longstanding ban on importation of quality semen from Europe that has led to a rise in number of semen imported into the country.
- A government effort to revitalize and restructure the Central Artificial Insemination Station (CAIS).
- A move to review the general breeding policies (although this effort may be subsumed by the general review of agricultural policy under the SRA). A key milestone for the consortium was the unveiling of the new Dairy Development Policy on April 6, which adopts the approach that KDDP had been advocating for over its years. The bill is expected to be tabled for debate in parliament.
- Keen interest in breeding issues by both policy makers and researchers. New projects, using some information and justification from the KDDP breeding assessment have given prominence to breeding (IFAD etc).

Policy in practice in the informal milk sector

A draft report of policy in practice in the informal milk market that investigates possible disconnects between national level rhetoric and local policy implementation has been prepared. The preliminary findings of this study have been presented and discussed in previous reports.

The analysis was meant to answer the question whether the policy change at the national level is also reflected at the local level, and whether the regulatory practice has changed to reflect policy intent and research recommendations.

Some of the final findings of the report include:

- There have been major changes in attitude and practice at field level in the informal dairy sector reflecting the change in policy at the national level, over the past five years.
- Generally, regulators have switched from a role often focused on heavy handed enforcement of regulations, to one that places more emphasis on education and guidance of informal milk traders.
- Informal milk traders have generally become more willing to legalize their businesses by obtaining the necessary licenses and abiding, where possible, with the appropriate regulations.
- At the local level, regulators have used their discretion in interpretation of the regulations, adapting these to make them workable within the prevailing small-scale milk traders' circumstances.

The draft once edited will be disseminated to stakeholders in the industry.



Dairy Stakeholders engage in breeding policy discussions

Sub-Intermediate Result: 7.1.2 Increased Use of Technology

Over its lifetime, the program identified and supplied appropriate technologies and information on feed conservation, feeding and good animal husbandry as basis for increased productivity to enhance dairy households' incomes. The program anticipated and provided technological and information needs that exceeded dairy stakeholders' expectations. The consortium's goal was to equip smallholder dairy farmers with modern technologies and skills on good animal husbandry and feeding regimes to enhance production of quality milk for the market. The demand for information on livestock production has expanded rapidly over the years due to sensitization by project and renewed focus on the enhanced productivity in livestock and dairy markets in Kenya. The activities undertaken under the IR were:

a) Identification and supply of validated technologies and dissemination of materials on feeding strategies

KDDP promoted appropriate feeding regimes for increased dairy productivity among the smallholders. A critical component was to promote feed conservation in wet seasons to counter fluctuation in milk production in dry seasons. Techniques such as silage making using various methods such as above-ground, underground or tube silage have been emphasized. About **82** fact sheets and feeding booklets have been prepared and disseminated since 2002. These covered various aspects of dairy such as feeds and feeding, breeds and breeding, animal health, general management practices, milk production, handling and marketing. The key milestones recorded over the program period were the development and dissemination of the **Smallholder Dairy Toolbox** and the publication of a **Manual on feeding dairy cattle**.

The Smallholder Dairy Toolbox: The Smallholder Dairy Toolbox is an innovative growing electronic compilation of agricultural information and dairy decision support tools available on CD; it is a one-stop shop for information and solutions to common issues facing smallholder cattle keepers in developing countries. It benefits resource-poor by making available relevant information and decision support tools which enables them to improve the performance of their livestock and related dairy enterprises.

The Tool and details on its use can now be found in the following website;
http://www.agritools.co.uk/sdtb_index.html.

The dairy toolbox has reached approximately **500** extension personnel and dairy practitioners spread out in Kenya. Over **30** institutions/organizations including Kenya Stud Book, SITE, CIP-Urban Harvest, University of Nairobi's Dept of Animal Production, Heifer International, MoLFD HQs, KEFRI, KARI,

have also been furnished with the kit. The realisation that the dairy toolkit has the potential to bridge information gap resulting from the limitation of access to accurate information on dairy production for extension providers and farmers, emanated from the field testing study of the toolbox. There is general consensus that more information on aspects such as trade should be uploaded in order to meet information needs of the dairy industry in totality, ILRI prepared a report highlighting several recommendations that have been passed on to the software designer. These include the need to create its awareness, additional write-up of the procedures for operating the toolkit, and developing sustainable system of updating the kit.



KDDP staff Margaret Wambugu demonstrates the working of the Dairy Toolbox to the Nyandarua District Livestock Production Officer.

Dairy Feeding Manual: “Margaret Lukuyu, Dannie Romney and Keith Sones, (2006). *Feeding dairy cattle: A manual for smallholder dairy farmers and extension workers in East Africa*. SDP/KDDP, Nairobi, Kenya.”

The publication covers various aspects of dairy cattle feeding. It’s designed as a manual for smallholder dairy farmers and extension workers in East Africa and includes information on balanced diets, energy, protein and minerals, forages, concentrates, feeding calves, heifers and cows, conserving forages and coping with drought. Several copies of the manual have been printed and are now being distributed to various stakeholders and libraries. Electronic copies can be requested from Dr. Baltenweck (i.baltenweck@cgiar.org).

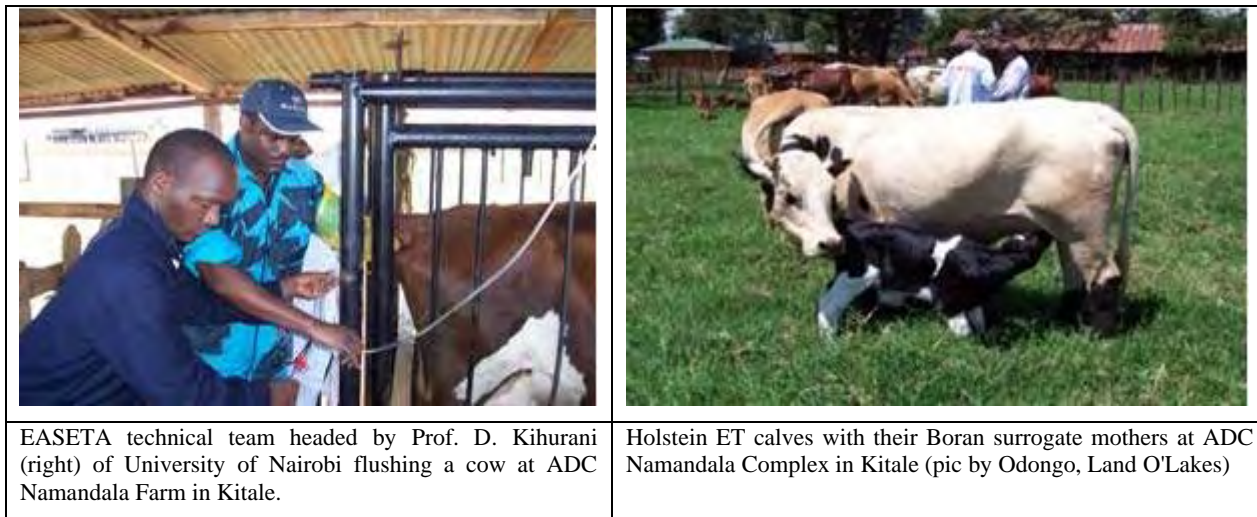
b) Multiple Ovulation and Embryo Transfer (MOET) Initiative

The utilization of AI using frozen semen has enabled progress in dairy genetics in Kenya. However, this progress has been limited to the male side of genetic contribution as cows could realistically produce only one calf per year. With recent advancement in MO&ET technology involving surgical and non-surgical procedures, cows can now produce many offspring in single year that can be implanted in surrogate mother cows, ensuring rapid genetic gain.

KDDP consortium spearheaded enhancement of local capacity to undertake MO&ET through collaborations with Agricultural Development Cooperation, Central Artificial Insemination Station and Kenya Livestock Breeders Organization in various technical seminars. With availability of heifers becoming scarce due to increased demand from local and neighboring countries, the development of ET skills is meant to complement the existing breeding efforts and provide additional incomes and incentives for farmers to enhance use of superior genetics sourced from America.

As part of its exit strategy, KDDP and its collaborators fronted for the formation of an umbrella body, culminating in the registration of East Africa Semen and Embryo Transfer Association (EASETA) in June 2006. The association has the objectives of promoting the use of improved genetics by way of AI as well as accelerating uptake of ET skills in Kenya and East African region. Through EASETA, local practitioners will obtain affiliation to the International Embryo Transfer Association, as well as

establishing Kenya as an acknowledged ET skill centre in the region. EASETA is also playing an active role in promoting the benefits of exploring ET. EASETA recently hosted a South African team who are looking into a joint investment with Agricultural Development Corporation in a livestock quarantine facility that would enable Kenyan livestock stakeholders undertake export of embryos and participate in international trade in genetic products. The facility is expected to cost Kshs. 5 million (USD. 72,464).



Use of Improved and Superior US Genetics

The program facilitated the sale and utilization of 239,858 doses of proven US cow genetics over its lifetime. KDDP facilitated training of AI commercial service providers and at the same time stimulated demand for the services by sensitizing farmers on merits of improved breeding programs. These improved technologies impacted on 91,549 smallholder dairy households exceeding projects target 87,000. The proportion of farmers using AI services (as opposed to bulls) also increased by **26%** over the project period with over **38%** reporting use of imported bull genetics.

The program through its partner WWS EA Ltd also introduced new embedded semen technologies into the Kenyan dairy industry. These are **gender-selected and gender-biased semen**. Gender selected semen also known as sexed semen, increases chances of getting a heifer-calf by **45%** as compared to the conventional semen. However, conception rates are low due to low sperm count and therefore recommended mainly for heifers because of high conception rates. On the other hand, out of **100** conceptions using Gender biased semen, *BOVATEL*, results in **10** more heifers than bull calves as opposed to use of normal semen. The new technologies have been well received and adopted by farmers. This has been fueled by increased knowledge and therefore demand for quality heifers for production/breeding purposes. High quality heifers also fetch between **KShs. 90,000 to 120,000**, as compared to price of **Kshs. 40,000**, two years ago thus providing an additional economic incentive for farmer investment in the elite semen technologies. Out of **three hundred** calvings, only **two bull calves** have been reported, representing a **99%** success rate of getting heifer calves. Below are pictures taken of some of the calves born out of gender sexed semen.



Three heifers born out of sexed semen at Mr. Sambu's farm in Eldoret. (Photo by Arum, WWS EA).

Some of the cows upgraded through KDDP's breeding initiatives have achieved up to **38** lts of milk per day.

At the national level, the local semen producer Central Artificial Insemination Station (CAIS) recorded sale of **400,000** doses of semen in 2007 as compared to less than 100,000 recorded when the project began in 2002. The program trainings have emphasized that even with better animal husbandry skills and feeding regimes, productivity will depend heavily on the genetic base of the cows.

Other breeding technologies introduced and promoted during the program period were:

- Liquid nitrogen refrigerators (vapor shippers and ordinary semen tanks)
- A.I breeding supplies (Thaw monitors, Thawing flasks and Thaw monitor ampoules)
- Computerized mating systems (Quick mate)
- **1** lt and **50** lt A.I transportation tanks fitted with pressurized liquid nitrogen withdrawal valves
- Ultrasound pregnancy diagnosis unit that enables pregnancy detection at 20 days after insemination thus enhancing breeding efficiency

d) The Milk Quality System

A major challenge has been that the development of Kenya's dairy industry has been driven mainly by quantity and not quality. This has limited its expansion and entry into the lucrative regional and international markets for dairy products and resulted in heavy economic losses for the stakeholders in the dairy value chain. KDDP introduced the Milk Quality System (MQS) technologies and Milk Quality Assurance services targeted at improving milk quality at farm level and along the dairy value chain. The former comprises of **6** real time cow side technologies that are not only new user and environment friendly but also affordable alternative to centralized laboratories that use non-portable and expensive equipments. The MQS also allows for immediate feedback and corrective action by farmers. These equipments are: PortaCheck-for determining somatic cell counts; Draminski-for determining electrical conductivity of milk; DQCI-for culture and identification of mastitis causing microbes; Delvotest-for testing presence of anti-biotics in milk, and LactiCheck-for milk components analysis; and Valiant Express Blue-A pre and post teat dip for control and prevention of mastitis. More information on these new technologies can be found at www.absglobal.com or www.edairy.com. Discussions on Milk Quality Assurance systems are presented in IR: 7.3.



LactiCheck for milk quality analysis



Demonstration of use of Valiant Blue in teat dipping

In response to increased awareness on clean milk production by the processors, over **312** new farms in Central and Rift Valley have adopted the new milk technologies. Particularly interest has been in proper diagnosis and use of a teat dip as a measure to lower the somatic cell count due to bacterial infection. Many of the service providers have found a niche in offering the service to the farmers. Farmers have recorded significant reduction in sub-clinical mastitis among their herds. For instance, target farmers with total herd of over **375** dairy cattle recorded a **25%** reduction from **105** incidences. Samples of stakeholders recording significant gains in milk quality and yields and related reduction in economic losses as a result of adoption of MQS are presented in **Attachment C**.

d) Udder Care and Management

KDDP introduced a number of technologies to fight against mastitis, known to be single most costly disease facing dairy farmers in Kenya. The total annual economic losses due to the disease are estimated at over \$20 million. Field surveys conducted earlier had shown a mastitis prevalence of 90% on farms and 20% among the herd. The program responded by the introduction of the Milk Quality System Technologies particularly *Valiant Express Blue*, a pre-and post teat dip with unprecedented mode of action. It employs chloride dioxide as germicide and is more effective as it requires no additional disinfectant. Valiant is designed to disinfect teats and forms a barrier that protects the udder between milking intervals against injurious microbes. It contains emollients that ensure soft, smooth and healthy teats and breaks down to water.

In addition, project staff provided capacity building for over **5,000** service providers and dairy farmers in udder care and use of pre and post-teat dip. Training was also provided for milk-testing personnel at milk collection centers on udder care and clean milk production. The use of teat dip now stands at over **10,000** cows per month. This has been largely evident in large farms, although small-scale farmers are demanding for the services through dairy cooperatives, milk bulking hubs and service providers.

Training of Trainers

Following requests from industry stakeholders and service providers, KDDP organized and conducted **Training of Trainers** sessions for over **400** AI, stockists and animal health service providers in udder care and management. The main purpose of the session was to offer refresher training and equip the ToTs with new technologies in order for them to train others effectively. The training covered various topics such as: early mastitis detection, screening of causative agents, establishing MQS, record keeping and management and emerging breeding technologies.

At the request of the industry regulators, KDB, Team ABS conducted a one-day workshop to build the capacity of **ten** KDB field staff members at the latter's Nairobi offices on milk quality, udder care and mastitis prevention and control. This was followed by a demonstration of the workings of the **6** MQS technologies. KDB are now in the process of procurement of the MQS technologies for use in their field offices.

Other New technologies introduced

KDDP/WWS EA also collaborated with Nairobi Veterinary Centre, a private sector player, in the introduction and testing of *Mastivac*, a vaccine for controlling mastitis in dairy cattle. *Mastivac*, gives full protection against all the bacteria that cause mastitis in cows. The technology is safe, convenient and affordable and results in increased production of quality milk. The use of *Mastivac* and training proper milking hygiene has greatly reduced mastitis incidence on dairy farms. Leka Farm in Kiambu, Thide Farm in Limuru and Mafad Farm in Wangige are among some of the farms that have recorded positive results due to use of *Mastivac*.

Other technologies introduced for effective udder care and management to enhance clean milk production are: **Artificial udders** for effective udder care training; and **Opal Perspex Glass Boxes (OPB)** for enhanced determination of mastitis causing organism identification.

Intermediate Result: 7.1.3 Sustainable Use of Natural Resources Management for Agriculture

Under this IR 7.1.3, the program promoted farmer adoption and use of new leguminous fodder varieties mainly Lucerne and Desmodium as alternatives to expensive cereal-based concentrates. The subsequent increase in quality feeds and reduction in cost of production has resulted in huge economic benefits to dairy farmers while maintaining the natural resource base in the targeted zones. As recommended by the mid-term evaluation, Land O'Lakes/KDDP took up and aggressively promoted utilization of cost-effective biogas technology as a more diversified use of manure to cut down on fuel related expenses and reduce environmental degradation from use of forest-based resources. The manure from biogas system is used to replenish soil fertility in the farms, thus completing the nutrient recycling loop. The program's approaches to the activities were as follows:

Scaling Up Adoption of Lucerne

KDDP through Land O'Lakes collaborated with Kenya Agricultural Research Institute (KARI) introduce several imported Lucerne varieties for testing and validation under different agro-ecological zones in Kenya. The collaboration was necessitated by the desire to provide solutions to high specificity of the technology in terms of its soil type requirements, lack of seed/planting material and suitably adapted varieties in Kenya. Eight (8) Lucerne varieties, including seven American-developed ones (WL 625 HQ, KKS 9595, WL 414, Robusta, KKS 3864, SA Standard, WL 525 HQ) and a local check, Hunter River (supplied by Kenya Seed Co. LTD), were studied in seven different agro ecological zones in the 2006 long rains season using a randomized complete block design with two replications. Each plot was harvested two times in the season to evaluate herbage production of the tested varieties.

The findings of the on-farm Lucerne disclosed that variety significantly affected Dry Matter (DM) yield in the wet highland zone only while age at harvest affected DM yield in the dry and wet midlands only. Varieties KKS 9595, Robusta and S.A Standard, WL 525 HQ yielded significantly more dry matter yield compared to the local check Hunter River in wet highland zone. Effect of variety on *leaf: stem* ratio was significant in the wet, mid and highlands while effect on harvest age was in all but dry highland zones. KKS 9595, WL 414 and WL 625 HQ were also significantly superior to the local check Hunter River in term of *leaf: stem* ratio in the wet mid and highland zones. In order to provide scientific basis for recommending the varieties, the KARI team compiled a paper entitled “*An evaluation of Lucerne varieties suitable for different agro ecological zones in Kenya*” which was presented at the annual APSK conference in Mombasa in March 2007. The paper and USAID/KDDP support for the initiative were well received by participating scientists from Kenya and across the East Africa region, and will form the basis to woo commercial seed vendors on arrangements to procure, market and distribute the new varieties to Kenyan farmers.



As a follow-up, KARI/LoL team organized a stakeholder seminar at KARI headquarters, Nairobi in Nov 2007, to share the results of the Lucerne trials and discuss the role of various stakeholders in up-scaling the adoption of the technology. The meeting was attended by over **50** stakeholders including farmers, representatives from University of Nairobi, Egerton University, private feed manufacturing companies, Agrovets/Stockists and Ministry of Livestock. USAID was also represented.

The results of the **8** Lucerne varieties from the eight sites / Agro-ecological were presented and ways to promote the adoption of the fodder technology discussed. A dairy farmer also presented his milk production scenario (with and without Lucerne), underscoring the importance of the fodder in dairy production. It was resolved that the following stakeholders pursue the following roles:

Researchers (led by KARI)

- To identify and look at the policy issues related to importation of Lucerne and the attendant issues
- To upscale the identified best bets under different agro-ecological zones and under irrigation and provide feedback.
- Refine the technical manual for both the extension agents and farmers
- Project and provide information on the demand for Lucerne seeds by farmers to commercial seed companies to support large scale production
- Conduct research and provide information on the economics of Lucerne cultivation and use to dairy farmers given many alternative uses of land.

Extension Service providers (NGOs/MOLD/Development Partners)

- Sensitization on Lucerne planting and utilization
- Distribution of information materials to farmers

Seed Companies

- Produce/import quality Lucerne seeds for commercial distribution to farmers

An organizing team was selected to follow-up on the issues with the respective stakeholders.

“Learning By Doing” - ToT Forums for Tubular Biogas Digesters

Drawing from lessons learned in the early 1980’s when the first batch of biogas digesters were installed in Kenya, Land O’Lakes Inc. developed a ‘learning by doing’ a methodology in promotion of use of biogas technology by dairy farm households. The BDS approach entailed partnering with Pioneer Technologies, a private-sector service-provider of biogas, to re-introduce an **affordable Polythene/tubular biogas technology** to smallholder dairy farmers with appropriate training and technical back-up in place to ensure sustainability. Training of trainers’ forums were conducted in Kericho, Kisumu, Githunguri, Kiambu, Mukurweini for **234** Training of Trainers (162 men and 72 women) with many of them expected to graduate into biogas technicians or stockists.

Consequently, over **229** dairy farm families distributed in the project zones have taken up the technology. Some of the adopters of the technology have cited improved health and hygiene in dairy operations as the kit is readily used for heating water for washing utensils and cow udder before milking. An ex-ante comparative cost-benefit analysis of installation and maintenance of the unit verses alternative energy sources in program sites revealed significant tangible economic benefits to the farmer. The collaborator with a wide reach to contact farmers all over the targeted zones as a result of enhanced linkage by KDDP will ensure availability and continued adoption.



ToTs feed a digester at a training session in Mukurweini, Nyeri (Pic by Josephine, Land O’Lakes)



Mrs. Buuri prepares food using a gas cooker fed by a biogas digester she installed at her farm through KDDP linkage (Pic by Odumbe, Land O’Lakes).

Intermediate Result: 7.2 Increased Agricultural Trade in Domestic, Regional and International Markets

In order to support increased production of quality dairy products, the program carried out aggressive generic consumption promotional campaigns to expand domestic and export market demand. This was to create a pull-back effect to increase productivity and efficiency along the value chain. The volume and value of trade in locally processed dairy products had risen by **14% by 2005** before the generic milk consumption and marketing campaigns **were terminated** following the mid term review. The mid-term exercise indicated that demand for dairy products was high and that the promotions undertaken by KDDP should be shelved so that more emphasis could be placed on productivity at farm level. However, marketing skills and capacity building at cooperative and local dairy processor levels continued.

KDDP has been building capacity on farmer groups' management to boost effective service delivery as they offer more stable and reliable market outlets for farmers. The groups also offer vital services such as A.I and inputs to its member farmers while affording economies of scale. The cooperatives were trained on various aspects of marketing namely: cold chain management, value addition, and provision of input services and linkages with processors. This was to improve efficiency in marketing and expand trade. Sales and intake records from **14** farmer groups that the program has tracked show that value of annual milk sales from the dairy marketing account only increased from Kshs. **389,603,438.2** in 2002 to **Kshs. 1,014,859,069** in 2007. At the same time, annual milk intakes rose from **25,088,202** lts recorded in 2002 to **52,461,700** lts in 2007. These represent enormous expansion of **160.5%** and **109 %**, respectively, over the program years (see success story of Mweiga cooperative under section E).

Cold Chain Management

Most of milk processed in Kenya is obtained from smallholders widely dispersed in the rural areas. The logistical challenge of linking these farmers to milk processors is compounded by poor roads and the highly perishable nature of milk. The need for streamlined collection, transportation and cooling of milk thus becomes critical. Milk as it emerges from a healthy udder contains very few bacteria. Its natural inhibitory system prevents significant rise in bacterial count for only the first 3 hours at ambient temperatures. Cooling within this period to 4°C maintains the original quality of milk and this is the method of choice for ensuring good quality milk for processing and consumption.

Over its lifespan, KDDP advocated for and facilitated rehabilitation and installation of **32** milk coolers, with a capacity of **56,320** lts and handling over **38,000** lts of milk per day in over **14** cooperatives targeted cooperatives. With chilled milk attracting a premium of **Kshs. 1.50** per litre and its operational costs estimated at **Kshs. 0.50 per litre**, the cooler is capable of supporting provision of other services such AI and milk bars offered to the cooperative members. The coolers have helped the farmer groups harness both morning and evening milk, reduce incidences of milk rejection due to poor quality and lower transport costs due to reduced trips to processor. This has translated to huge benefits for member farmers. KDDP also provided capacity building for the maintenance and linked coops to financial services to facilitate acquisition.

Example of a cooperative that rehabilitated its coolers and reaped in significant economic benefits:

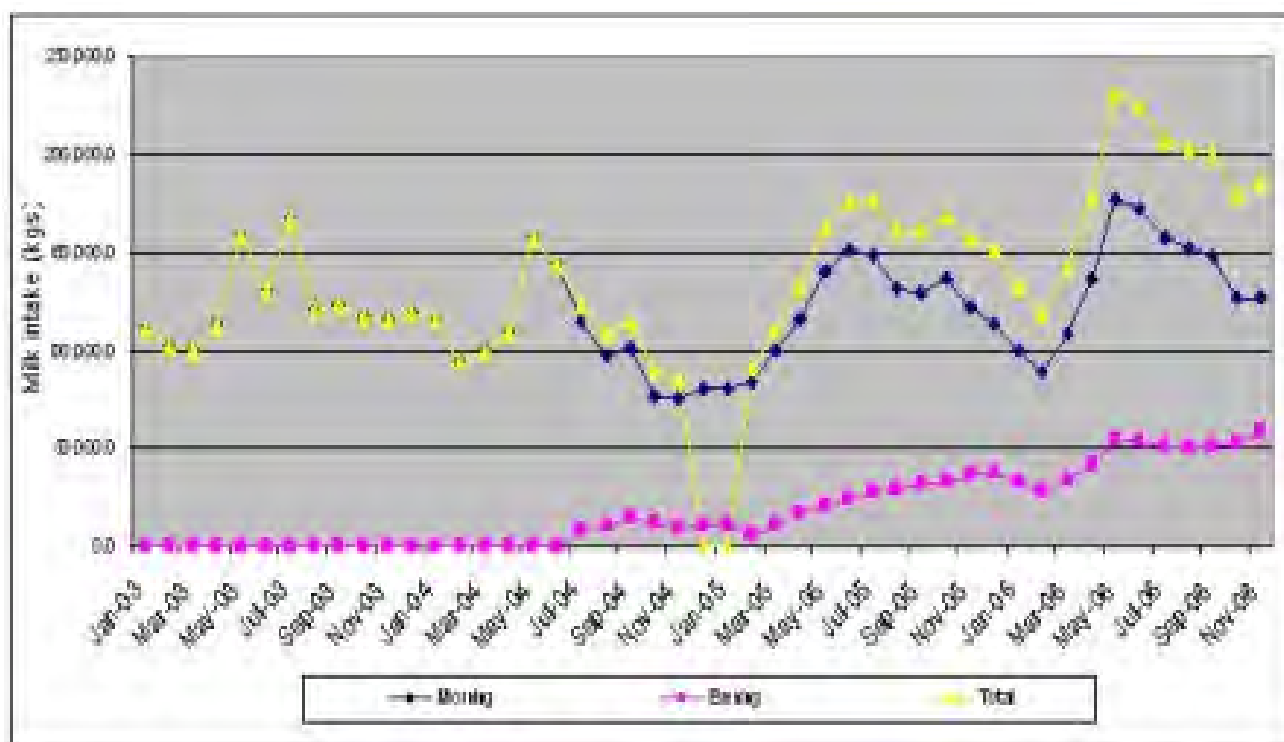
Rehabilitation of milk coolers boosts income for Enderasha Farmers Co-operative Society Ltd.

In 2004, KDDP helped Enderasha FCS to rehabilitate its two 1200-liter coolers that had been out of operation for several years. The cooling operations were officially launched by the then Minister for Co-operative Development, Mr. Njeru Ndwiga, in November 2004. The society had registered operational losses from July 2004 to January 2005 due to milk rejects by their client processor Spin Knit Dairy. With

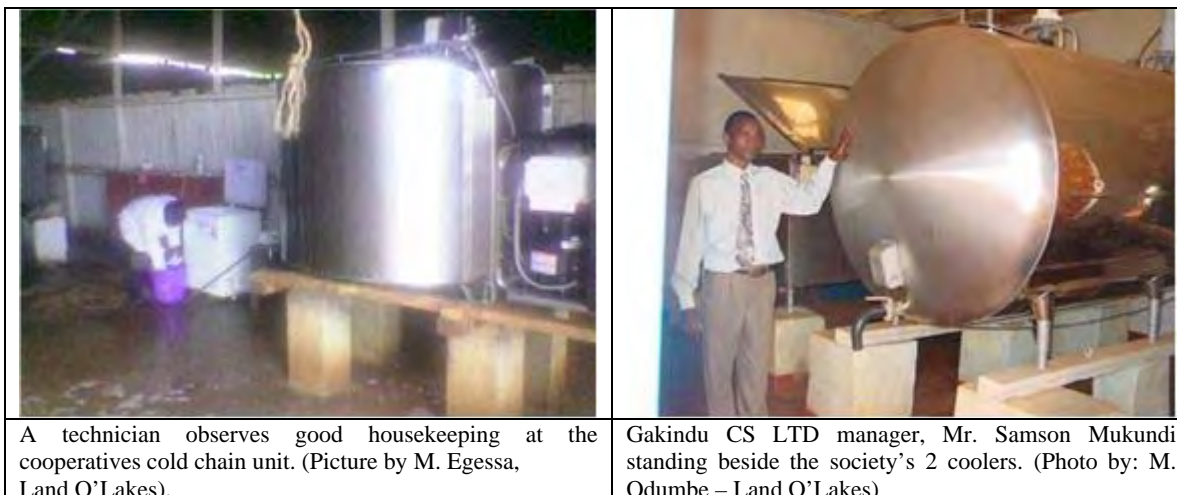
assistance from Land O'Lakes, the reason for rejections were investigated and identified as improper cleaning of milk containers by milk collection staff and mixing of evening and morning milk by farmers. Training was organized by Land O'Lakes for the staff and members to educate them on good agricultural practices and use of the cooler to collect evening milk. Since then the milk rejections have been kept at minimum with the losses converted into profits and higher payments for the farmers.

The evening milk collection now makes up about 41% of the cooperative's daily milk intake, a practice that has resulted in huge financial and social benefits for the farmers. When KDDP team visited the cooperative recently, farmers were found delivering milk through out the day. The farmers noted that the coolers have saved them the sleepless nights of having to wake up at three in the night to milk cows so as to make deliveries at the right time. In addition, annual milk intake for the cooperative grew from 1,301,274.20 lts in 2002 to 2,457,735 lts in 2007, an increase of 89% in traded volumes as a result of farmers' adoption of technologies and improved services at the cooperative. Below is an illustration of growth in milk intake for the cooperative immediately after rehabilitation of the coolers. The cooperative raised money for purchase of the spare parts.

Figure 1: Monthly milk intake for Endarasha Cooperative Society from Jan 2003 - Dec 2006



Note the rise in milk intakes, particularly evening milk following the rehabilitation of the cooperatives coolers in July 2004.



Other activities of the program under the resultre have been aimed at creating forums for business linkages and assisting community dairy groups/processors expand their local markets through targeted community promotional efforts with minimal cash contributions from the program. Examples of activities that KDDP collaborated in were:

- Trade fairs at Moi University, Chepkoilel campus in August 2006, collaborations between KDDP and USAID-funded sister project, KMDP. The objectives of the event was to create business linkages between stakeholders in the maize and dairy sector. Several stakeholders including Kenya Dairy Board, Equity Bank Ltd, Farm Machinery Distributors Ltd, CMC Ltd, Ministry of Agriculture, among others participated.
- Community dairy consumption was held for Midland Dairy Processors Self Help Group. The officials approached Land O'Lakes in March 2007 for advice on how to increase their marketed volumes in Thika town, with an estimated population of 350,000 people. KDDP/Land O'Lakes technical staff, Kenya Dairy Board staff and marketing service providers collaborated with the group's management to promote the groups dairy products. The group raised KShs. 22,900 (USD \$352) for the marketing exercise which included a parade of entertainers with dramatized dairy consumption kits and awareness messages through Thika town, escorted by police outriders. **Results:** Due to increased awareness and demand, the group gained an incremental income of **Kshs. 4,913** per day (KShs. **1,804,925** in annualized monetary benefits).

KDDP also facilitated and took part in initiatives to foster exchange of ideas and learning and expand Kenyan dairy exports in the regional markets. Samples activities undertaken were:

- ***New Product Development Concepts Seminar at Silver Springs Hotel, Nairobi.*** In an effort to increase the range of value added products in the market and to enhance milk consumption, Land O'Lakes/KDDP sponsored a seminar on product development for processing firms. In addition to improving on their profit margins, the initiative is expected to increase the incomes of rural households through better milk prices. Nine processing firms attended the session, which was co-facilitated with University of Nairobi's Department of Food Science and Technology.
- In collaboration with ESADA, dairy processors and other stakeholders, KDDP organized the first ever cheese and wine festival in East Africa at the Carnivore Restaurant grounds in August 2006. A second cheese and wine festival was held on 15th September 2007 at the same venue. The events accorded Kenyan consumers opportunity to samples varieties of cheeses and wines on display by processors from Kenya and neighboring countries. KDDP has worked on increased consumption of value-added dairy products such as cheese, yoghurt, to generate greater margins/surplus hence higher farm-gate raw milk prices for rural dairy households. The festival enabled processors to create

awareness on variety of cheese products available in the market. Several chefs from leading hotels such as the New Stanley Hotel participated in the judging. Perhaps the rewarding moments for KDDP at the festival was when one of the project beneficiaries, Meru Central Dairy Cooperative Union LTD, was voted the best yoghurt maker by the judges. **Eleven** processors had entered their products for competition in the category. The cooperative immediately received a tender by New Stanley Hotel for supply of the product to the hotel. Five judges ploughed through a total of **45** dairy products covering cheeses, yoghurts, cultured milk and flavored milk. Blue cheese from Browns was rated the best cheese. The festival attracted in excess of **1000** participants.

- In collaboration with Land O'Lakes Tanzania and ACIDI-VOCA Kenya/Egypt, Land O'Lakes, Kenya, hosted three dairy delegations from Tanzanian (one) Egyptian (two teams) of livestock stakeholders in April, May and June 2007 respectively. The ACIDI-VOCA linkage was another example of successful interaction between sister USAID-funded programs during the quarter. Tanzanian and Egyptian stakeholders were shown KDDP sites and had the unique opportunity of assessing operations of the Kenyan dairy value chain by visiting several program collaborators such as: **Homeland Foods, Nandi** – assessed operations of cottage dairy operator; **Lari Dairy processing plant** – farmer owned dairy processing facility owned and operated by a consortium of four dairy cooperatives; **Brookside Dairy Ltd**-Kenya's largest private dairy processor accepting milk from dairy farmers; **Central Artificial Insemination Station (CAIS)** – visited A.I. station to view stud bulls, semen harvesting operations and discuss Kenyan genetic material for potential export. The visitors registered great appreciation for KDDP program milestones in the Kenyan dairy sector and advocated for its continued support for the sector.



The dairy cattle parade at the Trade Fair held at Moi University, Chepkoilel Campus, on 24th August 2007. (Pic by Josephine Land O'Lakes).



Irwin Foreman, Land O'Lakes facilitates a session on New Dairy Products Development concepts (pic by Egessa, Land O'Lakes).



Thomas Holszinger, 3rd at the back form left poses for a photo with the jubilant staff from Meru Central Dairy Cooperative Union LTD. (pic by Egessa, Land O'Lakes).



Egyptian delegation at Central Artificial Insemination Station (CAIS), Kabete, to appreciate semen harvesting for sale to Kenyan farmers & regional export. (Photo by M. Egessa)

Sub-Intermediate Result: 7.2.2 Improved Performance of Agricultural Marketing Systems

Whereas the program scaled down its support for interventions under this IR and off-loaded most components to Kenya Agricultural Commodity Exchange (KACE), provision of timely and relevant dairy market information remained central in meeting the program's goal of enhanced rural households' incomes. Benefits from improved farm level productivity can only accrue to smallholder dairy farmers if they have access to reliable information regarding existing market opportunities. In line with the mid-term evaluation recommendation, KDDP's role has been to network with media stakeholders and provide technical content for educative programs targeting dairy smallholders. Achievements recorded over the program period were:

a) Market Information

- A total of **71** market information bulletins were compiled and disseminated to dairy stakeholders via mailing list, www.eadairy.com, faxes and information centers. KDDP/ABS also collaborated with a private farmer newsletter, 'Community Eye' in distributing over **70,000** copies of the magazine to dairy farmers in various parts of Kenya. The newsletter has information on dairy inputs such as bred heifers, benefits of AI use provided by KDDP.
- Kenya Broadcasting Corporation (KBC) took up broadcasting of dairy market information, providing a vehicle for reaching over a million people, countrywide. KDDP has provided content for over **30** of the educative programs aired on weekly basis on the *Mali Shambani* radio program. Among key areas highlighted were on milk quality and Rift Valley Fever. Milk quality is rapidly gaining importance in the dairy industry as a result of heavy economic losses associated with unhygienic practices. Use of Valiant Express Blue, a pre-and post teat dip in managing udder health and good agricultural practices have been emphasized to ensure milk that meets recommended quality standards. Other media houses such as *Touch* FM-Nakuru, *Mbaitu* FM-Eastern, *KASS* FM-Rift Valley and *Pwani*-Coast, reacted positively to the success of this collaboration by showing interest in doing the same to reach farmers in various regions of the country.
- In June 2006, Land O'Lakes/KDDP provided content for production of an episode in the popular TV series *Makutano Junction* aired at prime time on KBC that featured making of polythene silage. The program collaborators received over **4,000** sms requesting for more information on tube silage making. A follow-up survey on these farmers revealed that nearly all the farmers used the information provided, with majority of them sharing their experience with their neighbor farmers.

b) Website Activities

The program developed a web portal www.eadairy.com. The website has important information on the Kenyan dairy industry such as the suppliers of various dairy inputs, accredited service providers and their contacts, breeders' associations, dairy processors and the development partners. The site has registered an average of **250,000** hits per year over the program period. In terms of geographical access, North America topped the chart, recording the highest number of visitors with most of the users coming from the USA. Several enquiries on Kenyan dairy products have been received while information resources accessed have been of general nature.

c) Regional Information Centers

KDDP facilitated establishment of **6** static information centers in its operational zones. The centers have been useful in distribution of educational materials and have acted as good reference points for farmers to access new information resources that they may not afford or easily obtain. In addition, the project

facilitated dissemination of over **130,000** catalogues, articles and newsletters to farmers and service providers through field days, direct farm visits and the static centers over its life time. These articles were obtained from research institutions such as ICRAF, ILRI, KARI, MoLFD, and other private companies such as ABS Global, WWS, and Feed Millers. Farmers' attitude and understanding for the need for information has improved significantly over the years and they are increasingly demanding more information materials. The educational materials in high demand are those related to:

- Udder care
- Mastitis prevention and control
- Early detection of mastitis
- Milking equipment
- Fodder crops
- Feed conservation
- Dairy nutrition and feeding
- Breeding techniques

Enquiries for quality in-calf heifers and milking cows for breeding increased significantly. Notably farmers are seeking service of intermediaries/experts who earn a commission in the process. Previously, farmers lacked awareness on the benefits of proper selection of breeding stock in dairy production.

Sub-Intermediate Results: 7.2.3 Services for Agricultural Trade Improved

KDDP supported the operations of private businesses and commercial service providers through enhanced business linkages. The following are some of the dairy related transactions created through program information services and farm linkages.

- Farmer linkages and subsequent registration of their herds with Kenya Stud Book and Kenya Dairy Recording Services have increased by over **30%** as a result of linkages created by program. Cow registration adds value to the price of the cow especially in calf heifers by over **30%**.
- Two feed companies were linked to dairy farms, cooperatives and dairy groups around Naivasha, Nairobi, Kiambu, and Thika for supply of quality dairy feeds. A follow-up indicated that sales had increased by **over 500** bags of dairy meal per month worth over **KShs. 500,000 (US \$ 6,700)**.
- KDDP was linked Pioneer Technologies to dairy farm families that has led to installation of **195** biogas digesters and generated an income of over **KShs. 7,546,500 (US\$ 119,786)** for the collaborator.
- Three farmers Njuguna, Kibet and Kihumba were linked to markets for their **12** in-calf heifers that fetched them **KShs. 970,000 (US\$ 14,478)**.
- Linkages were enhanced between existing farms and upcoming ones on sourcing of quality replacement stock and hay. Ten replacement stocks were bought and over **300** bales of hay sold, creating income of over **US\$ 6,200** for the players.
- Over **40** breeding cows worth over **US\$ 30,000** purchased by different farmers within the target areas in the last quarter of the reporting period.
- The program facilitated sale of cows by farmers during the reporting period resulting in incomes to farmers amounting to Kshs. 390,000 (\$6000) through sale of breeding stock. The farmers were: Mr. Njuguna sold 2 cows @90000; J Kibet sold a cow @ 90,000 while Magdaline sold 2 cows @ 60000.
- KDDP mentoring and linkages for installation and rehabilitation of milk coolers have enhanced business for John Oka of Abba Refrigeration Ltd. His clients include private milk bulkers, milk bars and farmer groups. The businessman now enjoys good and regular income and can fend for his family. He has also purchase land worth **Kshs. 145,245** for development from the increased earnings. The successes of KDDP cold chain development are closely associated with this service provider.

- Asami Supplies Ltd evolved to be leading suppliers of polythene material for silage making. Asami sells an average of **one ton** of silage making polythene per month at a cost of Kshs. **200 kgs** due to linkages by KDDP. Over the last three years, the proprietor reported having sold **36,000 kgs** of polythene worth **Kshs. 7,200,000 (\$ 114,286)**. He has also over 50 biogas units @ Kshs. 25,000, receiving over **Kshs. 1,250,000** in revenue.



John Oka at his ABBA Refrigeration Nakuru workshop.
(Photo by Egesa – Land O'Lakes).

7.3 Increased Access to Business Support Services for Micro and Small Enterprises

KDDP targeted a number of producer groups such as cooperatives, FFSs and Self Help Groups to reach a significant numbers of smallholder farmers with technical skills and business support services cost effectively. The assisted milk bulking groups have provided their members with relatively stable market outlets, more bargaining power and affordable credit mechanisms for inputs and money suited to their cash flow needs. The program has worked with nearly **90** of such groups.

The groups were taken through the program's participatory planning workshops (PPWs), an interactive process where the group management and members are engaged in identification of the major goals of the group, strategies needed to achieve those goals, the key obstacles and how and when they will be overcome, prioritizing on the needs of the organization. The session is concluded by formulation of action plans for each group, specifying the role of various stakeholders, the time frame and measurable indicators that the team will use to gauge progress. This allows for systematic implementation of activities with the farmer organization taking charge of the process. Some of the cooperatives that have benefited from the program through enhanced access to business support services are: Mweiga, Endarasha, Ihururu, Olenguruone, Gatamaiyu, Lari Cooperative, Watuka DFCs, Wamunyu Cooperative Society, Wakulima SHG, Githunguri DFCs, Muki DFCs, among others.

Although the program made significant contribution towards increasing the volume of milk produced and marketed by the targeted groups, quality issues through the whole value chain had posed a major challenge. Low milk quality affected the ability of Kenyan dairy processors to diversify into higher-value products and take advantage of underserved regional markets. Unless these markets are exploited through improved quality, increased production will ultimately lead to low farm gate prices, a major disincentive to smallholder dairy farmers. **In the extension period**, KDDP initiated **Milk Quality Assurance** services by applying the universal concepts of **Good Agricultural Practices** (GAP-targeting increased milk production and transportation) and **Good Manufacturing Practices** (GMP-focused mainly on dairy processors) to address the challenges and economic losses. Over **400** milk traders and transporters have been trained on milk handling and hygiene in the extension period. In the section below, we illustrate how some of the players have benefited from KDDP milk quality services.

Linkage to Laboratory, GMP and HACCP Services Boosts Earnings for Lari Dairies Alliance Ltd

Lari Dairies Alliance Ltd, arguably one of the most innovative initiatives witnessed in the Kenyan dairy industry in recent times, may have been destined for closure shortly after entering the milk processing market due to poor product quality. The milk processing plant, owned by five dairy cooperatives (Kiriita, Kinale, Gatamaiyu, Lari and Kamahia DFCs) was formed with the objective of increasing returns to cooperative member farmers. Like dairy farmers elsewhere in Kenya, the members were displeased with the price offered for milk delivered to the established processing firms such as Spin Knit Dairies Ltd. After incorporating the dairy company, they presented their business plan to Kiambu Unity Finance which financed the undertaking at Sh75 million. The plant commenced processing in December 2006 and was paying a handsome price of Kshs. **19** per litre to the cooperatives as compared to Kshs. **15** offered by the other processing giants. However, an immediate challenge of recurrent losses of **Kshs. 500,000 per month** from product returns from the market due to poor and inconsistent quality became a significant threat to cash flow and normal business operations. “Closure of the plant was imminent and so were the livelihood of our farmers, given the loan we had taken. A crisis was at hand!” remarks Mr. Mathenge, the Quality Control Supervisor.



Staff at Lari Dairies Alliance monitoring the quality of their products (Photo by: M. Egesa – Land O’Lakes).



Thomas Holinzinger, a volunteer from the USA, assists Lari Dairies Alliance quality team draw up a HACCP program.

KDDP/Land O’Lakes linked the company to Analabs Ltd, a quality service provider, in order to access dairy quality audit and advisory services on plant hygiene. The KDDP team also organized and facilitated trainings for farmers and milk collection clerks on clean milk production, handling hygiene and the use of the new milk quality technologies. KDDP also facilitated a business linkage of Lari Dairies to Desley Holdings Ltd for supply of assorted milk testing equipment like strip cups for mastitis detection and alcohol guns screening milk delivered on collection routes.

Subsequently, milk products quality improved and losses due to returns were brought down **Kshs. 89,000** in the month of April 2007. Efforts between the dairy and Analabs are geared towards decreasing the loss further. Annualized savings on reduced losses on product returns amounts to **Kshs. 4,932,000, or USD. 75,877**. KDDP facilitated the processor to implement HACCP program in addition to Good Manufacturing Practices (GMPs). Adoption of the HACCP has improved milk and dairy products quality, safety and also lowered the operational costs at Lari Dairies Alliance Ltd. This has made them more responsive to specific customer needs especially those that demand for evidence of HACCP certification before engaging in business relationships.

KDDP's Milk Handling and Hygiene Course Reduces Losses for Tulaga Cooperative Society

Tulaga Dairy Farmers Cooperative Society was delivering an average of 17500 kgs of milk per day to Lari Dairies Alliance Ltd but losing about 1000 kgs/day due to adulteration with water and poor milk handling procedures by collection clerks. The loss incurred by the society and farmers stood at **Kshs 7,300,000/= per year** (365 days * 1000 kgs/day * Kshs 20/kg). While implementing the quality assurance programs i.e. GMP and HACCP at Lari Dairies Alliance Ltd, KDDP stumbled upon the milk reject statistics of Tulaga DFCS. To the Lari Dairies Alliance Ltd, their inability to process the 1000kg/day of milk rejected denied them an income of **Kshs 1,314,000/=** per year.

In collaboration with Lari Dairies, Tulaga DFCS management, KDB and the service providers, KDDP held a milk quality control and handling course for the cooperative's **73** milk collection clerks including the chairman and the manager on 2nd -7th of December 2007 at Naivasha. The milk collection clerks were taken through Good Agricultural Practices, milk testing using organoleptically (senses) and milk testing equipment and milk handling hygiene.

With their wide reach to dairy farmers, the clerks would intern impart the skills and knowledge gained to farmers thus resulting in significant reduction in milk losses. The milk clerks are already screening milk by performing various quality tests that they were unable to do before.



Mr. Wycliffe Kihumba, Manager Lari Dairies Alliance Ltd addressing participants at the Milk handling hygiene course at Naivasha.

A follow-up on the training revealed that the cooperative's loss was averaging 300 kg/day, implying that the farmers incomes will go up by **Kshs. 5,110,000/=** per year. KDDP has also helped the society source for a cooling plant that will raise the quality of milk and prevent members from incurring more losses through unwarranted waste of milk. "We are about to rehabilitate our 1,200 litre capacity cooler and have secured a loan from Cooperative Bank of Kenya to acquire a 5000 litre cooler. Operating both coolers will improve preservation of milk and reduce the amount of rejected milk by over 90 percent." says the chairman, Mr. Kimathi.

Today the society officials are confident that they will be able to pay farmers over 81 percent of their earnings once the coolers are operational.

Intermediate Result: 7.3.3 Non-Financial Services delivered cost-effectively

The project interventions under this IR have focused on strengthening of input service delivery and capacity of service providers to offer best breeding services to farmers. Both practicing and new service

providers were equipped with technical and business skills to enhance farmers' accessibility to affordable and efficient dairy support services.

a) Cost of Services

WWS/KDDP carried out its campaign on creating awareness amongst distributors, stockists and inseminators on cost effective methods of service delivery. The trainings stressed the merits of good record keeping and ability to anticipate and meet farmers demand for quality breeding information and technologies. Market information on distributors offering superior bull semen at affordable prices was also relayed to the service providers.

Technical seminars and refresher courses were also conducted for inseminators and Agrovets dealers to sharpen their knowledge and skills on modern breeding technologies and business practices. A total of **1007 technicians (732 men and 275 women)** have been taken through these courses over the project years. This has improved their knowledge on proper semen storage and handling, thereby reducing costs associated with Nitrogen losses. Examples of Agrovets and stockist receiving capacity building were:

- Jupiter Agrovet in Kiriani-Central Province
- Mifugo Agrovet in Kangema
- Menengai Agrovet in Nakuru
- Country Focus in Nyahururu

The farmers through extension education have appreciated and utilized the knowledge on proper heat detection methods. Fewer complaints are now reported on repeats as compared to the period when the operations began.

Land O'Lakes/KDDP in association with KDB and Dairy Training Institute (DTI) carried out a refresher course for **29** KDB accredited services providers on entrepreneurship, quality assurance services, hygienic milk handling, and value addition. These accredited service providers serve farmers, informal milk traders, milk bar operators, cooperatives, among others.



KDDP partners WWS EA ltd at an A.I technical seminar in Nyahururu. Picture by Arum of WWS EA.



Mr. Kamau of World Wide Sires (E.A) Ltd with keen farmers during a field day in Eldoret, Rift Valley.

b) AI and Agribusiness Training

Over its implementation period, KDDP provided capacity building for **266** new AI technicians on Agribusiness and Artificial insemination on a full cost recovery basis. This is comprised of **236** men and **30** women.

The new AI commercial service providers trained over the program period are envisaged to reach out to farmers more effectively. The use of BDS approach is to ensure commercial sustainability of service provision with clear exit points for program.



c) Establishment of AI service points

Over its lifespan, the program facilitated establishment of over **171** private service points and stations in its targeted regions. The approach has been effective in bringing the AI service closer and within reach of farmers. Establishment of Agro vet as distributors of quality bull semen has helped the technicians save on costs and time thus helping them cut down on service costs per insemination. The service providers are able to stock only what they need for a shorter period thus reducing on losses incurred as a result of accidents or due to lack of Nitrogen. The service providers cover relatively smaller radius but with more farmers, hence able to respond to immediate needs.

Several Agrovets shops have also been appointed distributors of semen. These include Smuka Agrovets, Katheniu Agency and Githunguri centre among others.

KDDP boosts income for a local service provider



Rapuoda on one of his motorbikes outside the building that houses his modest office in Eldoret town

Fred Rapuoda, 28, graduated from AHITI with a certificate in animal health in 2002. He could barely make enough money to survive when he started practicing in 2003, attending to sick animals in his home turf in North Rift Province. In 2005, Rapuoda was recruited and taken through the program's intensive course on artificial insemination and agribusiness by KDDP/ABS TCM as an AI service provider. He started practicing AI in 2006 after being equipped with the necessary kit on a loan package of **Kshs. 170,000** from the program partner. Today, Fred runs a successfully business that earns him a net income of about **Kshs. 42,000 per month**, by carrying out **150 inseminations** per month and attending to over **100 clinical cases**. He has since repaid the loan and employed 2 technicians whom he pays **Kshs. 20,000** each per month.

Rapuoda also runs an office and has also engaged an office assistant who earns **Kshs. 5,000** per month. Apart from the cash incomes, he boasts of over **Kshs. 558,000** incremental net worth as a result of support from KDDP. He says he is now able to comfortably provide for his family of two and support his brothers and sisters with school fees.

Intermediate Results: 7.4 Increased Effectiveness of Smallholder Groups to Provide Business Services to their members

Liberalization of the dairy industry in 1992 exposed the cooperatives to intense competition from informal sector. The previously government supported institutions found themselves faced with serious cash flow issues, mismanagement due to political patronage and as a result many collapsed. In recognition that associations and cooperatives are vital partners in delivery of development services to improve rural livelihoods, KDDP initiated and facilitated the building of organizational capacity of cooperatives as a key activity to ensure sustainable results.

The project facilitated training of cooperative management committees and staff to improve their capacity and capability to provide efficient services for their member farmers. Through this cooperative capacity building program, the program has granted several cooperatives (such as **Gakindu, Endarasha, Mweiga, Ngukurani**) new leases of lives. The advisory and capacity building courses centers on key managerial areas of governance, operations management, human resources management, financial management, business service delivery and external relations.

The Organization Capacity Assessment Tools (OCAT) was used to assess and identify areas of cooperative strengths and weaknesses and track related changes over time. However, the baselines were set in 2004 covering **29** cooperatives. The cooperatives were assessed on their capacities in various categories under the key managerial areas, using a score of 0-5, where 0-means non-existent and 5-full capacity achieved.

A follow-up survey was conducted in September to December 2006 and this assessment covered **21** of the initial 29 cooperatives. The findings indicate improvements in key managerial areas with sampled cooperatives recording total score of **over 100** each on the OCAT grid against the program target of **at least 60**. Total score on the tool improved by **3.5%** from an average of **143** (out of **220** possible on tool)

recorded in 2004. The greatest shifts in organization capacity were registered by (15%), Kiriita (14%) and Ngukurani cooperatives (12.7%).

In terms of capacity areas, Human Resource Management remains the weakest area, registering a score of 57% (2.85), an increment of 3% from 2004. This explains the observed high management turnover at the cooperatives. Financial management is still the strongest capacity areas and the core emphasis of the cooperatives business training to enable them serve their members. This area recorded a 4% rise over the assessment period. Shifts in operational management and business service delivery remained low due to slow decision making at the cooperatives. The results presented should be interpreted as improvements recorded between the two time periods and not over the program lifespan. This is because some of the farmer groups had made significant improvements in the capacity areas, long before the initial assessment was done.

Program Collaborations

- **MoLFD/Feed Companies and other dairy input suppliers:** Since its inception, KDDP associated with these stakeholders in facilitating farmers' access to extension services, training and information on emerging technologies. The ministry organized the forums and provided its staff while the private sector companies and KDDP facilitated their participation in the field days, seminars and agricultural shows.
- **KDB/DTI:** KDDP/Land O'Lakes/ABS TCM facilitated the process of retraining of accredited commercial service providers to enhance their skills in modern milk quality techniques. KDB had identified its accredited service providers as having training needs that inhibited their ability to effectively serve the sector. DTI provided equipment and boarding facilities. The collaboration began in 2007. However, KDB and KDDP continue to collaborate in sharing of industry information and best practices.
- **LoL/Pioneer Technologies:** Partnership began in 2006 to disseminate a cost effective tubular polythene biogas technology. Pioneer had the technology but with little outreach to dairy farmers. Land O'Lakes interests were in promoting a more diversified manure use to ensure sustainability of dairy enterprise. KDDP has linked Pioneer tech. to farmers for installation of the technology.
- **Nairobi Veterinary Centre:** WWS EA collaborated with Nairobi Veterinary Centre to introduce *Mastivac*, an effective vaccine for mastitis, the single most costly disease facing farmers in Kenya. Many farmers adopting the technology have recorded reduction in incidences of mastitis among their herds. The private sector firm had the technology but with little reach to smallholder dairy farmers.
- **Kenya Agricultural Research Institute (KARI) /University of Nairobi (UoN) /Agricultural Development Cooperation (ADC) /UC Davis:** Refining and customizing ICT based feed formulation tool to meet local conditions and demand for home rations. ICT feed formulation tool, PC Dairy has been developed for Kenya.
- **KARI/UoN:** KDDP through Land O'Lakes collaborated in carrying out field trials for imported Lucerne varieties to determine their suitability for different agro-ecological regions in Kenya. The collaboration was necessitated by the desire to provide solutions to high specificity of the technology in terms of its soils and technology requirements. KARI provided technical capacity. Partnership began in 2005.
- **Kenya Broadcasting Corporation /Fit Resources Group:** KDDP/ABS TCM partnered with KBC and Fits Resources Ltd to disseminate dairy information bulletins through the *Mali Shambani* and

Makutano Junction programs. The programs reach over 1 million Kenyans on a weekly basis. KDDP has largely remained a content provider for the educative programs. Other program collaborators in dissemination of market information are Community Eye, Media houses such as Touch FM, Kass FM.

- **ADC/EASETA/Ministry of Livestock/CAIS/ Kenya Livestock Breeders Shows:** KDDP consortium worked together with the above players to facilitate development and enhancement of skills of Embryo Transfer practitioners to up-scale uptake by farmers. The partners spearheaded the registration of Eastern Africa Semen and Embryo Transfer Association to lead in regional dairy genetic development.
- **KDDP/KMDP:** The sister projects have undertaken successful collaborations in holding trade fairs for enhancing linkages between stakeholders in the maize and dairy sectors. KDDP has also collaborated with volunteers from ACDI-VOCA managed Farmer-to Farmer program in enhancing capacity on livestock classification and registration and development of the
- **KDDP/ILRI** collaborated with **SITE and KDB** on a project aimed at improving Quality Assurance in Milk Markets (IQAM). The collaborators provided technical capacity building to milk traders to enhance their skills in milk handling, quality testing and hygiene.
- KDDP also collaborated with a number of commercial service providers in delivering effective services to farmers and farmer groups. Examples are ABBA Refrigeration in carrying out rehabilitation of stalled coolers in several cooperatives; Agri-solutions in carrying feeding and nutrition training to farmers.

D. CHALLENGES AND LESSONS LEARNED

1. CHALLENGES

- Quantity and not quality drives the milk sector. Milk quality continues to be a major challenge in various parts of the country as the industry is mostly driven by milk quantity. Most farmers are still finding it difficult to adhere to stipulated methods of milk production and storage. Raw milk rejection at reception platforms continues to be a major source of loss by farmers.
- Lack of specialized dairy development finance to support dairy investments resulted in low uptake of some interventions such as cold chain management that are essential due to poor infrastructure in some targeted milk producing areas.
- Variable weather patterns particularly protracted dry spells continue to be a challenge in high milk producing regions. Droughts experienced in 2004 and parts of 2005 resulted in little forage production undermining feed conservation and productivity.
- Women participation is still not at par with men. While women perform most of the dairy activities, the men feel that as the head of the family, they are the ones who need to participate in field days and seminars.
- Pricing of imported proven genetics is still a major challenge to farmers. Some technicians still charge high prices which lock out the potential buyers of affordable semen.
- Inability of some CSPs to offer appropriate technical advice to dairy farmers and other stakeholders on a range of dairy related services.
- The high turnover of management staff and slow decision making in cooperatives continue to pose challenge in turning them into effective service providers to farmers.

2. LESSONS LEARNED

- Dairy processors are beginning to respond the milk quality standards demanded by the export destination countries. Improvements in personal and milk hygiene will impact milk quality and sales of Kenyan dairy products.
- Targeted initiatives aimed at improving milk quality throughout the dairy value chain have significant economic benefits for farmers and value chain stakeholders.
- Adoption of silage making is growing exponentially, and manual or semi-manual technologies can only serve the dairy sector for the short term. Enhancing the ability or facilitating creation of new opportunities for silage-making as a business service, with varying levels of mechanization depending on the sophistication of the farmer, will be crucial towards ensuring quality silage, and sustaining high feed conservation adoption rates.
- Accredited commercial service providers (CSPs) have training needs that inhibits their ability to effectively serve the dairy value chain. Periodic refresher courses can greatly improve service-delivery by the providers for the benefit of the sector.
- Linking commercial service providers to the cooperatives has enhanced farmer access to affordable dairy support service through the check-off system with the cooperative. The units can afford economies of scale to their sizes.
- Significant interest in home made rations and feed formulation is being displayed by smallholder farmers. Market and price stability has created incentives to seek opportunity to increase productivity. Several farmers are seeking feed formulation assistance and have been supplied with customized feed formulation software package.
- The model Business Development Services largely used in this project was successful to establish sustainable dairy services. However, the application or use of this model is not universal but will depend on regional case by case basis. As milk marketing and payments improve, farmers are more willing to pay for services rendered.
- The absence of a vibrant beef industry in Kenya presents a lost opportunity for dairy farmers to increase their revenue from rearing male calves for beef production.

- Civil unrest significantly disrupted livelihoods, dairy production and markets and the negative impact of post election violence in milk sheds of the Rift Valley will most likely last longer than currently predicted.

E. SUCCESS STORY

Transforming Lives: Casual worker finds gainful employment in dairy

Titus Gatere can now see the light at the end of the tunnel. The 39-year old father of three's search for employment started in an unlikely setting in 1997 when he took to helping his ailing maternal grandmother with her cow, then grazed alongside the road. Gatere had just completed his O' levels, was married and had no job. He willingly took up the task and used a bull on the cow and when it calved down it, it only managed **5 lts** of milk per day. With the passing on of the grandmother in 2002, Titus took his only livelihood means (dairying) seriously. He developed further interests and started seeking advice on good husbandry from the ministry of livestock local offices. When this failed to pay off, he decided to come to Nairobi to look for a casual job to supplement income for his family of two in 2002.

Getting a casual job wasn't easy and neither was it well-rewarding. Occasionally, he would send money home and visit once when situation permitted. As time went by, he continually found himself in and out of jobs and times were really hard! Back at home, the wife, Selina, tended to the family's dairy and coffee enterprises. Her pursuit of knowledge and skills saw her join Kariara FFS set up by KDDP in 2004, to learn and share her experience on dairy with other farmers from her community. She disclosed her decision to join the FFS to her husband during one of his visits towards the end of 2004. Around 2005, Titus noticed that his wife had made significant improvements in managing the enterprise from the scratch he had left it. This began to re-ignite his dreams of self-employment in dairy and he supported her morally and financial where he could. When Selina got pregnant with their second baby, time had come for Gatere to return home as he could hardly make ends meet let alone hiring a house-help to help with the work that had increasingly become burdensome to the heavy wife.

Back at home, Titus took over the running of the enterprises in June 2005 and started attending the FFS classes. By that time, coffee market had plummeted and farmers in his community had started uprooting and replacing coffee trees with Napier grass for dairy. Well aware of the risks involved, he followed suit. Luckily for him one of the cows whom the wife had inseminated using imported semen from Taurus-Bench, had just calved down. With better feeding and dairy herd management regimes learned from the FFS, he was able to get **20 lts** per day. He raised the heifer-calf through recommended system and in 2006 was able to inseminate it using imported semen. He then sold it off for **Kshs. 35,000**. He reckons the in-calf heifer would have fetched **Kshs. 10,000** back in 2004. Elated, he used part of the proceeds to construct a zero-grazing unit and a water tank for his family. He also resorted to feed conservation by silage making and planting Napier which he did not have before.



Titus admires his dairy herd with his son during a field visit by the KDDP field team. (Photo by Odumbe, Land O'Lakes).



The farmer's quality intermediate heifer that he hopes to sell for over Kshs. 60,000 feeds at in-calf stage.



Mr.Gatere and his wife Selina, poses for a photo with their son outside their house in Kariara, Nyeri.

He raised and sold the second heifer at **Kshs, 28,000** and financed the purchase of a chaff cutter and its holding house to minimize feed wastage. He takes prides in having acquired substantial knowledge on selection and use of semen from proven bulls from catalogues and is now raising an intermediate heifer. At the moment, the cow on milk produces **17-18 lts** per day. “My children really love milk and that I am able to produce enough for them has saved me a lot of money. All his cows are now registered with the Kenya Stud Book. The family supplies **9 lts** to Wakulima Self Help Group and neighbors. His reputation as a good farmer has gained him self-esteem in the community and he is looking forward to breeding and selling more in-calf heifers and raising productivity of his dairy herd.

Gatere is now a facilitator with a new FFS he initiated called ‘Kuimenya’ meaning ‘know yourself’. He says meeting with new farmers and sharing of experience has broadened his mind and view of things. He can now confidently stand and share his experience with other farmers. He has diversified into other enterprises such as dairy goat production to help with milk for home consumption. He wants to pursue dairy farming as a purely commercial enterprise.

Mweiga Cooperative gets a new lease of life

Mweiga/Amboni cooperative society was started in 1964 by the settlers as a multipurpose cooperative society to market the then scheduled crops, coffee and pyrethrum. The society had an initial membership of 390 farmers who were given dairy cows on loan by the government. While the society experienced minor problems such as those associated with political patronage, the situation worsened with the liberalization of the sector and the subsequent collapse of KCC Ltd in 2000. The giant processor sunk with thousands of shillings in unpaid dues to Amboni farmers, a move that threatened their core business and unity. Since then the cooperative has withstood the test of time and today boasts of total membership of 1900 with about **1,200** active farmers. This growth in business, the members say, is closely associated with KDDP.

The collaboration between Amboni dairy society and Land O'Lakes dates back to the late 1990s when the farmer group's management capacity was enhanced through seminars/workshops that focused on governance and financial management. In 2003, KDDP assisted them to rehabilitate a dormant cooler which has helped the society to collect afternoon milk to absorb increased milk production from farms. The cooperative had unsuccessfully tried to rehabilitate the cooler donated to them in 1980's from Holland for years end on. They were linked to a refrigeration technician who successfully repaired it. The society's manager Mr. Wanjau indicates the rehabilitation of the milk cooler after 15 years of dormancy as a key factor in the success of the society. Rehabilitation of the cooler has enabled the society to resume twice-a-day collection from farmers who no longer have to preserve their afternoon milk under unhygienic conditions. The chilled milk also attracts a premium from the processors which has enhanced the income of members of the group.



Amboni farmers chairman (right) and manager stand next to the milk cooler that the society rehabilitated with assistance from KDDP. (Photo by Odumbe, Land O'Lakes).



USAID's Prof. Alex Lieu and Dr. Kilungo (2nd and 5th left) pose for a photo with member of Amboni LFFS during a visit to the cooperative. (Photo M.Odumbe, Land O'Lakes).

Perhaps the cooperatives greatest gift from KDDP is the Amboni Farmers Field School. The FFS is one of the most successful interventions with over **70%** of farmers adopting disseminated technologies and gaining **over 100%** rise in productivity. According to one member Mrs. Agatha Buuri, they learned various aspects of dairy husbandry and business including official registration of cows with the Kenya Stud Book, calf rearing, importance of artificial insemination and preservation of fodder, clean milk production, disease control, among other technical topics; it is through these field schools that the farmers learned new feed conservation skills. "In the FFS, we were challenged to look at dairy farming as a business," says Mrs. Buuri, who now delivers an average **30 lts/day** to the cooperative up from **15** liters prior to joining the FFS.

“High production by our members has enabled the management pay well since we have achieved critical economies of scale and earned bargaining power with the processors. Due to the farmer field school training, our total collection has remained fairly stable throughout the year. We could hit intakes of as low as **1,000** liters per day in dry seasons. But that changed to **3,500 Lts** when our members adopted zero-grazed systems and learned feed conservation under KDDP, ensuring a fairly consistent milk supply”, observes Mr. Wanjau. “In 1984, we had a major drought and the society almost closed down as most members lost livestock. It is through these field schools that our farmers have learned how to make bales of hay manually and grow fodder crops like Lucerne and turnips to sustain milk production and incomes.”

Amboni Dairy Cooperative Society LTD pays a minimum of KShs.17 per kilo after deducting the overheads. By paying the high rate, the group has managed to keep milk hawkers and other societies at bay. The society has been very successful in offering embedded services such as farm inputs and household consumable goods following KDDP training. They provide water to about 200 members who pay on a monthly basis; the group operates a feed store, selling about 200 bags per month to its members through check off system; it provides AI services and has employed two technicians to serve the animals; and advances credit to members to meet their cash flow needs. By penetrating into the interior to collect milk using its 3 four-wheel drive vehicles, the society has also managed to fight off middlemen. Many farmers have also been exposed to usage of tubular biogas plants as an alternative source of energy resulting in less destruction of the tree cover and more women devoting their time to productive work. The society is also a member of Meru Taifa SACCO and members can access loans which it guarantees.

Amboni DCS members have also benefited substantially from numerous farm tours and educational exchange programs facilitated by KDDP to dairy farming counterparts in Nakuru, Limuru and Kiambu in the process gathering vital lessons which they have implemented to boost their milk production. Collectively, these activities have resulted in the society recording a daily milk intake of **6,700** litres in the peak season and an average of **3,500** during the dry season since most members are able to produce consistently using conserved feed. The society employs **15** permanent workers and **19** casuals and had made major strides in diversifying its operation to include running a petrol station at Mweiga, bought with proceeds from farmers in 2004. The dairy account contributes **85%** to the society’s total revenue with stores, AI and water sales making up **5%**, **2%** and **1%**, respectively. The rest of revenue is generated from coffee and fuel sales.

The society computerized their financial and payments systems since buying a computer in 2004 and intends to buy two more to fully computerize their system. They intend to make it a giant cooperative with front office operations, expand the AI department to include animal treatments and introduce an animal feed mixture for ration formulation using the local available feeds for its members. Among the challenges facing the farmers is the fluctuation of milk prices and imposing of quotas by the processors during flush periods this has led to some farmers selling their milk to middlemen who give better and instant payment. Amboni dairy society is now working with five other cooperatives to build a processing plant in Kieni so that they can be able to offer higher payment rates for their farmers.

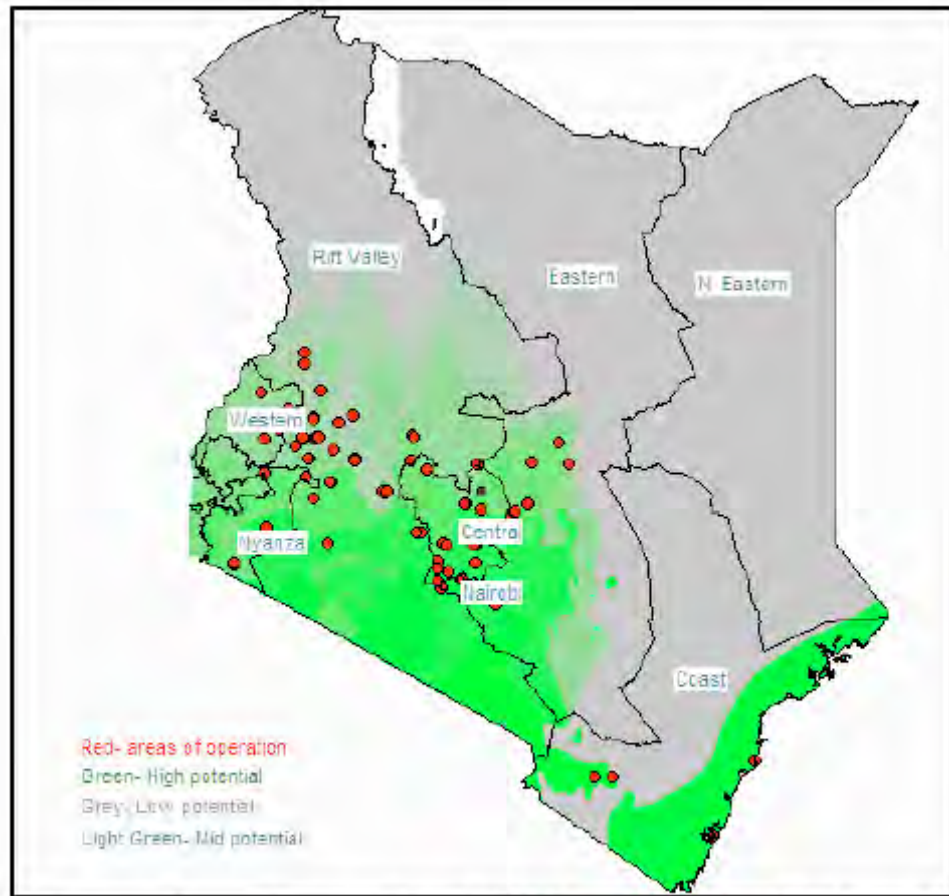


Mr. Charles Wanjau (right) charts with KDDP's M&E Specialist, Odumbe, when the team visited the cooperative recently.



The cooperative's clerks using the computers installed at the cooperative. Computerization of the systems has enabled them process farmers dues in shortest time possible

ATTACHMENT A: KDDP IMPACT AREAS



The map above shows where KDDP works as by AEZ