


Focus on Kenya

Sponsored by:



Contents

- p2** From the desk of the Executive Director
- p6** The key to growth
- p9** Welcome to Kenya
- p10** The road to recovery
- p14** A gift that touches many
- p16** Hope brings a smile
- p20** Land O'Lakes Kenya
- p22** For the love of maziwa
- p27** Female farming power
- p31** Milk money goes mobile
- p33** Cool solutions for dairy farmers

A portrait of Dr Kipkirui Lang'at, Executive Director of Esada. He is a Black man with short hair, wearing a white dress shirt and a pink patterned tie. He is sitting in a dark blue office chair, with his hands clasped in front of him. The background is a plain, light-colored wall.

Dr Kipkirui Lang'at,
Executive Director of Esada

From the desk of the **Executive Director**

World Dairy Day, celebrated on 1 June, came at a time of great challenges in food price inflation and security. The celebration was followed by the World Food Summit in Rome between 3 and 4 June.

In the run-up to the Summit, many countries were battling with ways to find a quick fix to the rapidly deteriorating food situation, with many countries experiencing food riots. Some of the emergency measures decided upon, include policies to protect vulnerable groups such as consumers, and plans to encourage local supply in order to mitigate price increases.

Food consumption

The reality is that the world has failed to take the necessary steps to deal with food security and hunger, when it should have. The director-general of the UN's Food and Agriculture Organisation, Jacques Diouf, laments that wealthy nations have spent billions of dollars on farm subsidies and wasteful food consumption.

"The excess consumption by the world's obese, costs US\$20 billion annually, to which must be added indirect costs of US\$100 billion resulting from premature death and related diseases." He wonders how a world

that spends US\$1 200 billion in arms, could not raise US\$30 billion to feed some 862 billion hungry – a group development gurus now call the “bottom billion”.

The rise in food prices did not spare dairy. In fact, 2007 FAO estimates show that dairy product prices had the steepest increase among food crops. This came as a result of low stocks in major producing countries, a discontinuation of EU subsidies, and bad weather in Australia and neighbouring countries.

Food prices

In 2008 prices seemed to be easing, mainly due to supply responses and resistance by consumers against higher prices. The easing of prices may, however, be temporary due to the continuing grain shortage and high costs. What does this portend for Africa? It is not good news.

First the average *per capita* food consumption in African countries is currently at 25 kg *per capita* – still well below the World Health Organisation’s (WHO) estimate of 200 kg *per capita*. In short, higher food costs will drive consumption down.

Secondly, availability may be more limited since some countries are highly dependent on imports. According to existing trade records, dairy trade is an important component of intra-Comesa trade.

Total intra-Comesa trade in dairy products, amounted to US\$25,6 million in 2006, while total extra-Comesa trade (or trade with countries outside Comesa), amounted to US\$383,2 million. Intra-Comesa trade in dairy makes up only 6,7% of the total trade. Comesa countries conduct trade with countries outside the region, those being mainly South Africa, the EU countries and Australia.

Opportunities for Africa

The above scenario and the gap represent massive opportunities for the region in

terms of exploiting the huge potential that other countries in the region have. These opportunities present the chance to increase production and trade dairy products among themselves. These opportunities can only be exploited if the region focuses on the full value chain.

It is therefore instructive to note the many public private partnerships that exist in Eastern and Southern African countries, aim at analysing and understanding the value chain and thus design appropriate policies and technological innovations.

We therefore welcome the Gates Foundation’s US\$42 million project in Kenya, Uganda and Rwanda. The foundation is the ideal vehicle to enhance existing programmes run by other players, including the USAID-Rates and Land O’Lakes programmes.

Specifically it has to be noted that dairy presents the greatest opportunity to assist millions of small-scale dairy farmers and their families, to lift themselves out of poverty and hunger by increasing productivity and profitability on their farms.

What is Esada doing?

Now let me turn my attention to Esada’s activities in the run-up to the publication of this issue. We are in our fourth year since the organisation’s inception. We have been at the forefront in fulfilling our mandate of setting the stage and acting as a catalyst and forum for the region, to increase trade in African dairy products and work towards an improved regional policy environment, conducive to regional and international trade in dairy.

We are especially proud to have been part and parcel of the harmonisation of dairy standards for Comesa and the East African Community (EAC). These standards are now complete and the preparation of the SPS protocol is now in its final stages. The development of dairy training programmes

and the mobilisation of consumption of cultured products, are promoted through the annual cheese festival.

When Esada is not organising its own programmes with key partners, it actively participates in other forums that add value to agriculture and dairy. Notably, the Executive Director participated in the Forum on Developing Agricultural and Agribusiness Innovation, organised by the World Bank Institute in Dar es Salaam, Tanzania. He will also attend the US-Africa Business Forum which is geared towards investing in Africa.

Dairy is gaining recognition as a potential source for development into an integrated

robust industry that can deliver marketable products through innovative models. This can be done by:

- Linking poor farmers with markets
- Building a cold chain, while using farmer associations as channels for acquisition of vital input products and services, including finance and equity participation.

All investments, be it at farm, chilling and bulking, or at processing level, will need to be supported by the development of a range of new products that are marketable for the growing number of consumers in Africa and beyond.



Our fourth conference

Esada is pleased to announce that the 4th African Dairy Conference and Exhibition will be held on 6-8 August 2008 in Nairobi, Kenya. The conference will allow international dairy stakeholders to interact with experts, practitioners, investors, researchers and policy makers in the African dairy industry.

This desk wants to take the opportunity to welcome all of you to this special annual event, billed to be the best ever, judging from the number and range of participants already registered. Over 300 professionals from all sectors of the dairy industry will offer attendees an unmatched opportunity to meet, network and share the latest information on the dairy industry.

Under the theme "African dairy: Regional integration – the key to growth" the conference will be an avenue to place Africa on the

world dairy map and give the continent new impetus to exploit its potential.

Finally we wish to reassure all the participants that the post-election violence that took place in Kenya at the beginning of the year, resulting in the postponement of the conference from June to August, is now behind us. The country is safe and facing the future together as a nation. Efforts to mitigate the effects of the violence on the dairy industry are in high gear and the results of the stabilising situation, is there for you to see.

Welcome to Kenya!!! And welcome in advance to the 4th African Dairy Conference and Exhibition.

**Dr Kipkirui Arap
Lang'at OGW
Executive Director**





Peter Mwaniki Ngaruiya,
Programme Manager, Esada

The key to growth

by Peter Mwaniki Ngaruiya, Programme Manager, Esada

The fourth edition of the premier African dairy event, the African Dairy Conference and Exhibition, will be held in Nairobi, Kenya, from 6 to 8 August 2008. Building on the continuous improvement of the last three successful events, the 4th African Dairy Conference and Exhibition (4th ADC&E) promises to be a bigger, more successful and better value for money event.

This year's theme is guided by the accomplishments and other activities going on both in Comesa and the East African Community (EAC). The initiative by Comesa and the EAC to move towards custom unions, presents considerable trade opportunities for the member states.

In tandem with its mandate to promote increased intra-Comesa trade as well as extra

Comesa/EAC exports of dairy and allied products, Esada could not but seize the 4th ADC&E platform to articulate this incredible milestone in the dairy trade.

Dairy standards

Esada has been unwavering in harmonising the dairy standards and SPS protocol across Comesa and the EAC region. Esada is proud to report to members and the dairy fraternity in Africa and beyond, that the daunting task of regionally harmonised standards for dairy, has substantially been completed and the draft standards are with the relevant authorities in both Comesa and the EAC. The standards should be operational soon.

Esada, in collaboration with other partners in the dairy industry, is committed

to promoting trade as this is paramount to improving the living standards of millions of producers and other players who rely on dairy for their livelihood.

The 4th ADC&E once again provides the players in the region and beyond, with an unrivalled opportunity to learn from each other, build their client portfolio and promote their brands to potential clients within and outside of Africa.

The event is a convergence of players in the full dairy value chain. Over 400 delegates within and without Africa are expected to attend the event. Over 1 500 additional visitors are expected to tour the exhibition during the public open day.

“The dairy sector in the Eastern Africa region and in particular Kenya, has recorded impressive growth in the recent past”

The dairy sector in the Eastern Africa region and in particular Kenya, has recorded impressive growth in the recent past. The 4th ADC&E will provide a clear platform, particularly for service providers at various levels of the value chain (production to consumption) to make inroads into the Eastern Africa region.

A not-to-miss event

Esada is privileged to have Pete Kappelman, the chairperson of Land O'Lakes Inc, among other distinguished regional and international speakers presenting a wide range of topics at this auspicious occasion.

A carefully planned conference programme featuring all aspects of the dairy industry, has been put together. It is hence without doubt that the 4th ADC&E is the event of the year for any dairy practitioner in Africa and beyond, not to miss.

The event will offer field trips to fully registered participants at the conference. This includes a tour of a large commercial dairy farm and a leading dairy plant just outside Nairobi, a trip to a dairy farm with a farm demonstration, and a visit to a packaging plant. This will provide an ideal opportunity to network and experience some of the Kenyan dairy industry.

The exhibition

The exhibition will be the perfect venue to showcase dairy and associated products, machinery and services. Exhibition booths will be set up indoors and all dairy breaks will be hosted in the exhibition area, to provide an even greater interaction between participants! Increase your visibility as a dairy industry leader by purchasing a booth space or sponsoring an event!

Key regional and international players have already confirmed their participation. These include Trepko, Packo Inox, Nichrome, CHR Hansen, Danisco, Zentis Polska, Unga Farm Care, Spin Knit Dairy, New KCC, Happy Cow, High Chem, Chemoquip, De Laval, Norbrook, Forbes Marshal, TESSA ltd, Pfizer, Farmco BV, GOMA and Future Pak.

Esada would like to salute the 4th ADC&E sponsors: Unga Farm Care, CHR Hansen, SIG Combibloc, New KCC, Tetra Pak, Heifer International and Happy Cow. Thank you for making this event an even bigger success.

We call upon all dairy stakeholders to come forward in support of the event. A few sponsorship opportunities are available that will further highlight your brands in the region and beyond. I invite you to visit our website www.dairyafrika.com for more information. You can get in touch with Esada on secretariat@dairyafrika.com or call +254 20 374 4065/356 5190.

On behalf of the Esada, it is my pleasure to invite you to register for this auspicious African dairy event of the year. **DMA**



Welcome to Kenya

Welcome one and all to a page-by-page tour of the dairy industry in our great country, Kenya.

Kenya is largely an agricultural country. The livestock sub-sector accounts for the largest share of the agricultural sector, contributing more than 40% of the agricultural gross domestic product (GDP) and 10% of the total country GDP. The dairy sector is an important player in the livestock sub-sector, accounting for 4% of the country's GDP.

It is the provider of much needed nutrients, leading to a strong and healthy nation, thus enabling the country's citizenry to become a truly working nation. The various strategies that have been put in place, have seen the sector registering one of the highest growth rates in the country.

This has not only led to increased producer prices – currently standing at between ShK16-22 per litre, but has also made the industry a much sought after investment destination. This has in turn led to increased production at farm level.

The country is thus self-sufficient in milk production and has a surplus which is exported to the neighbouring countries of Uganda, Tanzania

as well as Comesa countries. These exports provide us with an enormous opportunity for trade and business prosperity within the region. This is done with due recognition to the fact that regional integration is a sure way to ensure growth within the sector.

The fourth African Dairy Conference and Exhibition in Nairobi from 6 to 8 August this year, will offer a great opportunity for regional and international dairy stakeholders to interact with experts, practitioners and other stakeholders in the dairy sector. Here they will be able to network and share the latest trends and information in the dairy industry.

Feel free to learn about the dairy industry and more about Kenya, as you experience exposure to our great scenery and lively dairy environment.

Machira Gichohi
Managing Director
Kenya Dairy Board





The road to **recovery**

by Fidelis Zvomuya

Kenya has 25 active milk processors with an installed daily processing capacity of 2,9 million litres

As the Kenyan dairy sub-sector is still reeling from the effects of post-election violence, which saw farmers lose about 170 000 cows worth ShK10 billion, the government has come up with a recovery programme aimed at restoring the industry to its pre-election state, says Machira Gichohi, Kenya Dairy Board managing director.

The violence saw some milk collection centres and processors' production levels dropping by 50% of their normal dairy production. Farmers, traders and other role players in the country say that the industry has been negatively affected and is in need of urgent attention following losses due to post-election political violence, coupled with the combined effects of the escalating cost of diesel and high livestock feed prices.

Gichohi says the objective of the recovery programme is to support the re-emergence of dairy production, to ensure minimum levels of income and food security to the affected communities as well as for a continued viability of the Kenyan dairy industry at large.

"The number of people affected by the post-election violence, whether displaced or not, is beyond what can be sustainably supported by a social welfare programme. The proposed response to the impact is underpinned by a livelihood approach based on three objectives," he says.

Three recovery pillars

The three plans entail the provision of immediate assistance to the affected communities, the protection of livestock and assistance in the rebuilding of key assets that were destroyed during the period of violence.

Gichohi says the proposed response will therefore focus on the overlap between emergencies, livelihoods and livestock. This will in turn support interventions at four levels, namely farm production, input supplies, marketing interventions, and the policy and regulatory environment.

The Kenyan government recently announced a one billion Kenyan shillings (ShK1 billion)

cattle restocking programme to assist farmers who lost their stock during the violence. Jacob ole Miaron, former permanent secretary in the Ministry of Livestock and Fisheries, says the dairy herd improvement programme will assist in covering milk shortfalls. Dairy farmers are also going to benefit from the ministry of trade's rural and industrialisation programme.

Aftermath of the elections

Prior to the post-election violence, Kenya's dairy sector had registered a remarkable growth with milk production going up from 2,8 billion litres to 3,8 billion litres annually, with the price of raw milk increasing from ShK8 to ShK21.

"The epicentre of the violence affected a region of the country that supplies about 50% of milk produced, particularly in the Rift Valley, Nyanza, Western Kenya and Nairobi. This led to major disruptions in farm level milk production operations, milk collection and transportation, processing, distribution and retailing of finished products. Medium- and small-scale dealers who handle the majority of the marketed milk, were severely affected," Gichohi says.

John Wachira, national secretary of the Dairy Traders Association, says some of his organisation's members had their equipment and business premises destroyed and many of them were displaced.

"The violence affected all stakeholders in the dairy industry in different ways. This led to failure of milk supply systems which greatly affected consumers. It also led to the manufacture and sale of low quality feeds and supplements, disruption of farmer groups, milk collection, transportation and distribution, retailing systems and milk markets and consumption. However, milk business operations have resumed in those affected areas," Wachira says.

He says most of the traders ran their businesses in the areas where violence erupted: "Some of us employed the people who were being killed. Our businesses were looted, shops burnt down and we lost a lot in terms of revenue.

We are still in the process of investigating the effects and we will come up with statistics as soon as possible,” he says.

Despite the loss, Wachira is positive that Kenya will maintain its leading position in milk production and looks forward to a more vibrant sector in a few months to come.

A history of change

Kenya's dairy industry spans over 90 years and has undergone various evolutionary stages, Gichohi says. In the first 60 years it was dominated by large-scale farmers, while in the last 30 years smallholders have increasingly dominated the sector, contributing over 80% of total milk production.

“Secondly, it has evolved through three marketing periods. For the period up to 1969, it operated as an open market with various independent dairies being active market participants, while between 1969 and 1992, and primarily due to the rationalisation of the dairy industry by government, a monopolistic market situation was created. Thirdly, since May 1992, the government liberalised the industry and opened up the industry to market competition,” he says.

With liberalisation, more of the cooperatives ventured into milk processing and private players invested in processing. Many of them are involved in processing and marketing pasteurised milk and other dairy products. These include yoghurt, *mala*, cheese, butter and ghee. So far, Kenya has managed to be largely self-sufficient in dairy products, except during extreme drought years.

The demand for dairy products is on the increase, primarily due to the increase in population, improved income and the emergence of new external markets.

The country enjoys preferential market access within the Eastern and Southern Africa region, notably regional trade blocks such as Comesa and EAC, which has brought significant benefits in dairy trade. Sub-Saharan Africa accounts for 3% of the world cow milk

production and Kenya accounts for 18% of this.

About 60% of total milk production in Kenya is produced in the highlands, using exotic and crossbred dairy cattle. Milk production from the Zebu, particularly in agro-pastoral areas, contributes a small proportion of milk to local rural markets, as most of it is used in the homestead. Smallholder dairy farmers contribute over 80% of the total milk production in the country.

More milk

Available statistics show that milk production in Kenya has been increasing minimally, but steadily, from 1993 to 2006. This milk is primarily produced from cattle, camels and dairy goats. Their relative share in the estimated total milk output is 84%, 12%, and 4% respectively.

“About 60% of total milk production in Kenya is produced in the highlands, using exotic and crossbred dairy cattle”

Kenya has 25 active milk processors with an installed daily processing capacity of 2,9 million litres. The industry has invested in modern milk processing plants to ensure quality and efficiency. The major milk processing companies have achieved ISO 9000 and HACCP certifications, which relate to food safety and quality.

The industry produces a wide range of long-life dairy products which include UHT milk, cheese, butter, ghee and powdered milk, among others, and has registered substantial growth in the last four years in terms of milk intake by the formal sector and growth in both local and export markets.

The quantity of processed milk has grown from 143,5 million litres in year 2002 to 423,1 million litres in 2007 – a 194% growth. Kenya's dairy products are renowned for their high quality and good taste. **DMA**

A gift that touches many

Heifer International is a non-profit, humanitarian organisation dedicated to ending world hunger and saving the earth by providing livestock, trees, training and other resources to help poor families around the globe become self-reliant.



in need, starting a chain of giving that often touches thousands of lives.

Heifer Kenya

Heifer Kenya started its operations in 1981 through the invitation by the Quakers Church in Western Kenya. It started by supporting a women's group with a dairy cow project in Kakamenga district.

Under the representation of Technoserve Kenya, the programme grew gradually in its activities, covering more districts and diversified support to communities with livestock species to include dairy goats, meat goats, oxen, donkeys, beehives and camels.

To date, the programme has three fully operational regional offices in Nyanza, Coast and Western Kenya and has grown to cover six provinces and a total of 31 districts.

In addition to the direct support to communities with livestock, Heifer Kenya is currently supporting communities to initiate livestock enterprises including milk, meat and honey marketing, community based animal health service delivery systems and also supports private livestock service providers in the areas of animal health, extension and artificial insemination.

In 2006/07 the programme continued strengthening capacities of the supported families through training and provision of various livestock and livestock related services in order to contribute to the improvement of the quality of their lives. In addition, the programme also continued supporting communities to develop and strengthen market linkages to enable them to sell surplus livestock and livestock products.

Since it began in 1944, Heifer has worked directly with seven million families in more than 125 countries and in 38 USA states. Animals from Heifer International provide milk, eggs, ploughing power and other benefits that for families across the planet can mean improved nutrition, education for children, health care, improved housing and literally a new way of life.

What makes Heifer unique, is the practice known as "passing on the gift". Families receiving animals agree to pass on the first offspring or an appropriate equivalent to another family

In order to manage the rapid programme growth, Heifer Kenya continued developing and strengthening capacity of the staff and partners through training in various fields in order to enhance quality in programme management and community economic development.

Programme vision

The vision of the Heifer Kenya country programme is that by 2010, Heifer Kenya beneficiaries, staff and stakeholders will have sustainable and secure livelihoods, dignity and hope for the future and will be resourceful, sensitised and aware of gender, HIV/Aids and living in a healthy environment.

To attain this vision, the Heifer Kenya programme implementation team comprises of relevant and strong partners, farm associations and collaborators to provide technical support and social welfare to the vulnerable groups of men, women, youth and children, while focusing on integrated farming systems, business development, diversification of livestock enterprises and participatory monitoring and evaluation.

The Heifer Kenya programme and office has effective and efficient systems, procedures and policies managed by competent staff.

Key priority areas of the strategic plan:

- **Staff development:** Heifer Kenya staff will be skilled, competent, motivated and facilitated adequately to manage the ever growing Heifer Kenya programme activities effectively and efficiently
- **Capacity building for project participants:** Project participants will be adequately skilled in managing the projects for self-reliance
- **Enterprise development:** Market access and linkages through value chain systems, project participants will be able to sell their surplus farm products, have incentives and are motivated to continue improving the quality of their lives
- **Resources and donor support:** The Heifer Kenya programme will attain self-sufficiency in fund raising and will address the staff, partners and community needs adequately
- **Livestock and technical support:** Heifer

Kenya will enhance the capacity of the communities adequately to be able to manage the livestock and other resources for maximum productivity

- **Partnership and collaboration:** Heifer Kenya will have relevant and appropriate partners filling identified gaps for holistic service provision to communities
- **Gender and HIV/Aids:** Heifer Kenya constituents will be sensitised adequately and will be aware of gender equity and HIV/Aids.

Family support

Heifer Kenya has so far supported 6 206 families on both the original and Passing on the Gift Programme. A total of 4 003 dairy cows were given to communities, 2 640 being originals and 1 353 under the Passing on the Gift programme. A total 1 949 dairy goats were given, 400 as pass-ons. Also 226 meat goats, 1 416 beehives, 317 camels, 286 oxen and 30 donkeys have been passed on.

During the year 2006/07, a total of 800 families were supported by the Maasai Livestock Health and Marketing project to vaccinate their livestock against major diseases. Of these families, 315 were from Loita area, and 485 from Keekonyokie. This project does not provide livestock to communities, but helps them to improve the health of their livestock.

Dairy promotion

Heifer Kenya has been partnering with other players in the livestock industry to promote dairy production. Its dairy vision is to reduce poverty through income raised through sales of surplus milk, so as to enhance the socio-economic needs of farmers and the community at large.

A total 7 436 farmers marketed 10 517 884 litres of milk through Heifer Kenya through five cooling plants, earning a net income of ShK153 228 091 (US\$2 321 637). The cooling plants, Manyeso, Siongiroi, Kipkelion, Tanykina, and Ol Kalou, used the money they realised to support the educational needs of their children, improve their homesteads and reinvest the money in their dairy activities through purchasing improved breeds. *DMA*



1 Before the Bill & Melinda Gates Foundation grant, project participants received all kinds of animals

Hope brings a smile

by Ray White, Heifer International public relations director

A matching grant from the Bill & Melinda Gates Foundation, totalling US\$45,3 million, will enable Heifer International to help one million small farmers in Kenya, Uganda and Rwanda.

These three countries are three of the world's poorest, devastated by malnutrition, genocide and HIV/Aids. The grant will help realise their dreams of self-reliance.

Bill Gates, speaking at the 2008 World Economic Forum in Davos, Switzerland, announced a four-year, US\$42,8 million grant from the Bill & Melinda Gates Foundation to Heifer International, which includes a US\$2,5 million matching grant.

Combined, the grant and Heifer-raised matching donations will secure a total of US\$45,3 million for the East Africa dairy

development (EADD) project, which will help farmers in Kenya, Rwanda and Uganda achieve better livelihoods through dairy farming – significantly increasing household income through profits generated from the production and marketing of high-quality milk.

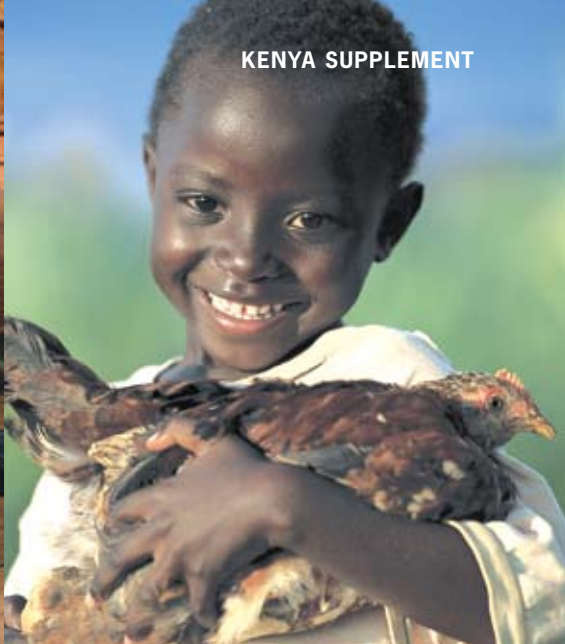
Gates said that Heifer will lead the project with two partner organisations as sub-contractors – TechnoServe, a US-based enterprise development organisation, and the International Livestock Research Institute (ILRI) of Nairobi, Kenya. Heifer has four country programmes in East Africa, which centre around integrated livestock farming.

Dairy development

Before the Bill & Melinda Gates Foundation grant, project participants may have



2 The East Africa dairy development project focuses on dairy cows



3 The foundation believes that agriculture is important to help people come out of poverty

received dairy cattle, goats, camels, bees, donkeys or fish. Projects typically incorporate gender equity and HIV/Aids training, as well as leadership development and values-based planning for community development. The East Africa dairy development project focuses on dairy cows.

In eastern Africa, it's almost impossible for subsistence-level farmers with little land and only a few cows, to participate in the dairy industry or make real economic progress. Dairy cows there typically produce little milk. Even if a family's cows could produce more milk than needed for household consumption, they would have to sell the excess immediately, because of the lack of refrigeration for storage.

So more than 90% of the milk in East Africa is sold at the farmgate or to peddlers who sell it at village markets or milk bars. But real profitability lies in becoming part of the commercial dairy industry producing consistently high-quality packaged milk products.

Heifer's EADD project solves this problem by placing refrigerated chilling plants at strategic locations where farmers can bring their milk for storage and pickup by commercial dairies. Then even a very poor farmer with a single cow can participate in the dairy industry.

In addition to the chilling plants, the farmers need cows that produce more milk. To improve cow breeds and production, the project will rely on artificial insemination, using high quality bull semen to impregnate local cows. The resulting hybrid cows will inherit resistance to local diseases, while having greatly increased milk production.

This is a twist on Heifer's usual method of placing a pregnant dairy cow with a family. But since the cost of artificial insemination is only a few dollars, many more farmers will be able to participate. In this unique case, Heifer's tradition of "passing on the gift" will mean that a participating farmer will pay for insemination services for another farmer's livestock, rather than passing along an actual animal.

Training groups

The farmers will receive training in Heifer's small community groups. These groups will be consolidated into "dairy farmer business associations," larger groups with thousands of farmers. There will be 30 farmer business associations, each owning and managing one of the chilling plants.

Chilling plants are the linchpin of the EADD project – the point where even a farmer with only one or two cows may join the profitable dairy industry. "This piece falls in line with our work with value chains," said Kristin Grote, associate programme officer in agricultural development at the Bill & Melinda Gates Foundation.

Value chains refer to all the steps from producer to consumer in a single industry. In the dairy industry, this would include the farms, chilling plants, transportation lines, milk processors, sales outlets and finally the consumer.

"What we have observed," said Grote, "is that, although there may need to be strengthening over the entire chain, there is usually one blockage point that prevents some people from having access to markets. So this proposal fits perfectly within our strategy because it addresses chilling plants, which is the key blockage point that keeps smallholder farmers from earning higher incomes."

Dr Lutz Goedde, senior programme officer in agricultural development at the Bill & Melinda Gates Foundation, also praised the project for addressing the entire value chain. "It targets everything from getting animals to people and improving the quality of animals and animal-husbandry practices to actually having a market for the products the animals are producing.

"Farmers can produce more milk or more crops, but then there is no market for them. But in this project we are making sure that the additional products that are produced by the farmers can generate better incomes."

Heifer's EADD project also has a gender component that ensures the participation of women, not only as participants but as leaders in the business associations. This

suits not only Heifer's cornerstone value of gender equity, but the Bill & Melinda Gates Foundation's focus on the one billion people living on less than a dollar a day, of whom a disproportionate number are women.

"We believe that agriculture is important to help people come out of poverty. That is the underlying paradigm," Goedde said. "Livestock is an important part of that area, because a lot of the people engaged in it are women, especially in sub-Saharan Africa. Women are the livestock keepers."

"Real profitability lies in becoming part of the commercial dairy industry producing consistently high-quality packaged milk products"

Better quality milk

Heifer's proposal to generate higher quality milk from improved cows and a collection system that accommodates poor farmers struck the Bill & Melinda Gates Foundation as a successful way to help people in East Africa improve their income and nutrition, which would lead to better education, housing, health care and quality of life.

"Heifer makes a good partner for the Bill & Melinda Gates Foundation," Dr Goedde said. "Heifer is obviously one of the leading organisations doing this in the world, and we're very happy to partner with Heifer for their reach."

Jo Luck, president and CEO of Heifer, says: "The foundation's support and recognition of our values-based model, and the size and scope of the project, take Heifer to a new level in our endeavours to help the poor overcome poverty. We're proud to have been selected by the Bill & Melinda Gates Foundation and appreciate the confidence placed in our work."

The East Africa dairy development project will be administered by Heifer's Africa programme staff at its Little Rock, Arkansas headquarters and by its in-country staff in Kenya, Rwanda and Uganda. **DMA**

Land O'Lakes Kenya

Since 1998, Land O'Lakes has been providing technical assistance to the dairy sector in Kenya through funding provided by the United States Agency for International Development (USAID). The goal of the technical assistance has been to increase the productivity and competitiveness of commercial dairy enterprises at farm, cooperative, and small and medium enterprise level, with the ultimate goal of increasing household income for rural dairy farmers.

Land O'Lakes led four partners, African Breeders Service Total Cattle Management (ABS-TCM), International Livestock Research Institute (ILRI) and World Wide Sires (WWS) East Africa, in the implementation of the USAID-funded Kenya Dairy Development Programme (KDDP). The programme began in October 2002.

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. An overarching 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 utilising natural resources sustainably while developing the industry.

Geographical focus

To ensure that USAID-allocated resources to the programme were utilised to capture the greatest rates of return on investment, the Land O'Lakes consortium targeted geographic areas of high and medium

agro-ecological characteristics (Central and Rift Valley provinces), best suited for milk production.

The programme 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 centres, to target the dairy interventions.

KDDP concluded in October 2002, bringing to the end, an era of key milestones and achievements that have revitalised the Kenyan dairy sector by enhancing efficiency and effectiveness of service delivery in the value chain. An independent economic impact assessment of the programme revealed overall net economic benefit to smallholder farmers of over \$35 866 853. The other key achievements for KDDP programme were:

- 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 a result of adoption of high quality feeding regimes and modern breeding practices
- Reduced cost of milk production by 16% in its lifetime. New fodder legumes such as lucerne and desmodium promoted by the programme, have reduced smallholders' reliance on expensive commercial based concentrates

- Pioneered and initiated 60 farmer field schools in the dairy sector. The LFFS have provided learning platforms for widespread technology adoption by farmers achieving over 50% average increase in cow productivity
- Facilitated sale and utilisation of 240 000 doses of high quality bovine genetics, impacting on 91 549 farm households. Some cows upgraded through the programme initiatives, have achieved over 38 litres per day against the national average yield of about 5,3 litres
- Identified and supplied over 21 new validated technologies that have met and exceeded expectations of dairy stakeholders. Elite semen technologies such as sexed-semen and biased semen have increased heifer conception rates to 99%
- Provided capacity building for 1 767 new commercial service providers in the targeted zones. The BDS providers have enhanced farmers' access to reliable and efficient dairy support services with clear exit points for the programme
- The programme launched the Milk Quality Assurance services complete with six 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 Good Agricultural Practices and Good Manufacturing Practices
- Facilitated rehabilitation and installation of milk coolers with capacity of over 56 000 litres in 15 farmer groups through mobilisation of farmer resources. Improved cold chain management has enhanced economic benefits due to increased intakes and reduction in spoilage and rejects
- Realised 109% and 160% increases in volume and value of trade in dairy products respectively in targeted cooperatives over the project's lifetime. KDDP training emphasised efficient service delivery to farmers
- Disseminated over 130 000 bulletins, journals and education materials to enhance best dairy practices in the value chain. Farmers' demand and utilisation 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 harmonisation of AI syllabus and licensing of private sector trainers and trainees. Land O'Lakes, through KDDP, has persistently negotiated for and supported private sector-led development in the industry.

Since April 2007, Land O'Lakes has also been implementing the USDA-funded Kenya Food for Progress Dairy Programme, targeting the dairy producing areas of Eastern province of Kenya.

Contact us:

Regional representative or country

director: Land O'Lakes Inc

Westlands, Peponi Plaza,

Block A, 2nd floor

PO Box 45006 _001000, GPO,

Nairobi, Kenya

Tel +254 20 374 8526/374 8685

Cell +254 722 517 149

Fax +254 20 374 5056

E-mail lolkenya@landolakes.co.ke



Land O'Lakes

INTERNATIONAL DEVELOPMENT

Innovative Solutions for Global Prosperity



Wilfred Mutembegi, one of the dedicated young dairy smallholders in Kenya

For the love of maziwa

by Fidelis Zvomuya

The 17-year-old Wilfred Mutembegi arrives at Muthiru Dairy Farmers Self Help Group in Meru, in Kenya's Eastern province, riding his bicycle. On his bicycle, Mutembegi is carrying two 25 litre cans filled with raw milk, which he has come to deliver at the

milk collection centre. The milk comes from his 5 ha farm. He wipes sweat from his face, and begins off-loading his precious cargo.

Mutembegi looks tired, but he is doing what he loves most – feeding the nation with good quality milk popularly known as *maziwa* in Kenya. He is proud to be one of the farmers

supplying the market with good quality raw milk.

Mutembegi has just cycled 10 km with a load of 50 litres of milk in two aluminium cans. He starts joking with other young men who have also come to deliver their milk at the centre. The milk is tested, weighed, chilled, and then taken to Brookside Dairy for processing, before it reaches the consumer.

Great expectations

“I like dairy farming. It is my passion and I would love to grow with the profession and one day own my own commercial dairy farm, processing my own milk and adding value to the product,” he says. A proud graduate of Land O'Lakes' Farmer Field Schools, Mutembegi says that after the knowledge he gained from these sessions, he believes that milk must be marketed through the formal market.

“I will never sell my milk through the informal market, even if they offer me ShK50 (50 Kenyan Shillings) per litre. Since the farmers' schools I have seen the need to put consumer health first, before monetary gains,” he says. As a small farmer, but with big ambitions, he owns two cows that give him nine litres each per day.

The cows were bought for ShK4 500 each two years ago and have managed to secure him two more Friesian heifers. Mutembegi is one of the 5 000 registered members of the Muthuru Dairy Farmers Self Help Group and one of the 1 600 active members.

Eldad Ndwiwa, the group's chairperson, says the project was started in 1996 after farmers had encountered market problems and were facing delayed payments from processors who were already there.

Step by step

The project started with only 30 farmers who were producing 166 litres of milk per day. “When we started, we were operating under a tree. Our milk production was very low, as most

of the cows were indigenous, giving farmers an average four litres per cow per day,” the chairperson says.

At that point some of the milk used to go bad as it was exposed to dust, and milk loss was high. After six months, the farmers decided to rent a small room in Meru which they used for storage and as an office.

The milk was being marketed to hawkers before they decided after one year, to sell their product to Meru Central Processors. “We used to hire a car to take our milk to the processor. We were being paid ShK9 per litre and our production by then had gone up to 800 litres.”

“Since the farmers' schools I have seen the need to put consumer health first, before monetary gains”

“In 1998 we moved from selling our milk to Meru Central Processors and started to sell to Kenya Cooperative Creameries Ltd. We moved to KCC because it was offering us ShK12 per litre. This also saw an increase in the number of farmers to 600 and our production to 1 000 litres per day,” Ndwiwa says.

The farmers realised that the room was no longer big enough to accommodate their product and at the same time was expensive. “We were paying ShK400 for a room that was no longer accommodating our produce. So we decided to buy a plot. Farmers were asked to contribute ShK1 for every litre delivered to the centre,” he says.

In 2003 the group moved to Brookside Dairy, as the latter had offered them ShK14 per litre. Their new building was also ready. They moved back to Meru Central Processors, before going back to Brookside six months later after striking a better deal.

Every bit helps

By 2004 every farmer had contributed ShK2 500 and membership had grown to 1 800.

Loifred Muchiri (left), the Muthiru plant manager, and Eldad Ndwiga, chairperson of the Muthiru Dairy Farmers Self Help Group



“We managed to raise ShK2,5 million which we used to buy our first stand and construct the building. We continued with the shilling per litre delivered contribution and raised another ShK2,7 million which we used to construct the current premises. Also the other ShK1,1 million we used it to buy a generator as a measure to cut our costs,” says Ndwiga.

Loifred Muchiri, the plant manager, says the reason why they had to move from the old site was due to the fact that it was some 2 km off the main road.

And then, in 2004, Land O'Lakes started training the farmers in animal husbandry, milk handling, hygiene issues, business management and artificial insemination (AI). Land O'Lakes also organised a look-and-learn visit to Nakuru, for which they footed the bill, giving farmers who went, the opportunity to learn even more.

“Our farmers use donkey carts, bicycles and *matatus* [the Kenyan equivalent of a taxi or pick-up truck] to deliver the milk to the centre. We thought if we are close to the road, it would be easier for those using *matatus* to carry the cans some few metres off the road,” Muchiri explains.

Milk production

About 1 600 members are now delivering 7 500 litres of milk per day and are selling their milk to Brookside Dairy. The farmers are paid ShK20,50 per litre, as all the milk they sell to Brookside is chilled.

The plant can handle 20 000 litres per day. Ndwiga says that despite volatile milk prices, hundreds of new young farmers get started in dairying each year.

He says that compared to other types of livestock farming, dairying can provide a higher income per animal, monthly paychecks and, in many areas, more markets.

The dairy industry rewards and encourages competition among farmers. Most of the farmers own between two and three cows and they farm on plots of about 5 ha each. The centre is connected to the electrical grid and have a generator which they bought for ShK1,1 million.

The centre offers its members Artificial Insemination-services. It also gives the farms seed, vaccines and medicinal supplies on credit. The amount is then deducted from the milk supplied.

The Land O'Lakes connection

Land O'Lakes has provided the farmers with services that include the introduction of highly productive genetics; training on animal productivity and artificial insemination; fodder production and conservation; disease control; milk handling; record-keeping and marketing.

"All the benefits and skills that I enjoy at the moment, are all from the training that I got from Land O'Lakes. The organisation triggered a spirit of entrepreneurship, not only in me, but in many more young people who are among the many unemployed," says Mutembegi.

In one of the best demonstrations of the powerful socio-economic impact of a successful project, Muthiru Dairy is making a positive change in many lives in Eastern Kenya. The centre has trained AI-inseminators who provide the services to farmers at a fee of ShK600. The centre also offers the farmers feed, vaccines and other services on credit.

Muchiri says they experience seasonal fluctuation of intake owing to changing pasture regimes associated with dry climate in the months of January-February and October-November. He says they have trained their farmers in animal feed and water conservation for dry periods.

Muthiru intends to start processing milk once daily intake reaches 60 000 litres per day. "The benefits we are getting for bulking our milk at this centre, entails great savings on transport costs, improved quality, hygiene, development of a social fabric and a common place for distribution of inputs," Ndwiga says.

The centre places special emphasis on quality assurance systems and standards, and it promotes regulations for each stage of the production system. This includes the milking process, transportation and bulking. **DMA**



Magdalene Muiruru milking one of her cows. Muiruru believes that good quality milk is the foundation on which her farm is built

Female farming power

by Fidelis Zvomuya

Turning manure into biogas has been a triple win situation for many smallholder dairy farmers in Kenya. It has managed to reduce daily farm expenses, through the provision of an affordable source of energy, replacing the time spent for fuel wood collection with money-making activities, and reducing the release of greenhouse gases that cause global warming.

“The introduction of a digester at this farm has seen us operating in a more environmentally-friendly way,” says the owner of Eve Farm, Magdalene Muiruru.

Muiruru says animals are an important source of food and income for many poor rural people, but their manure is a source of one of

the world's most potent greenhouse gases, smell and flies. The biogas at Eve Farm uses the dung from the cows that goes into a digester, gas comes out and is used to warm water that her milkers use to clean the cow udders and cook their food. It also provides lights.

When gas is produced, out comes the slurry, which the farm uses as organic fertiliser for the production of Napier grass, vegetables and other crops grown on a three-acre plot.

The life of a dairy farmer

With a philosophy that a happy cow is a productive cow, Muiruru says the life of a dairy farmer is made up of long hours and hard graft: Awake before dawn, work all day long and unable to rest until the cows rest first or come home.

“More milk means more money, but our biggest challenge is how best we can preserve the environment and at the same time produce profitable products. As farmers we are also confronted with the challenge associated with high feed costs and this has led to African farming being one of hardship and decline,” she says.

Hence the need to make sure that farmers farm on an environmentally-friendly footing, so that they can produce their own feed environmentally and preserve, Muiruru says. According to her, modern dairy farming is becoming a highly commercialised, skilled business which requires a large capital investment.

“More milk means more money, but our biggest challenge is how best we can preserve the environment and at the same time produce profitable products”

“Returns are seldom phenomenal and they are often discouraging. Many farmers have found it a highly satisfying, profitable venture; others have barely made a go of it. The more successful dairy farmers earn as much as \$1,50 to \$2 per hour for their labour and management. Others receive as little as 30 cents per hour. But the bottom line is that I am in this because of the passion I have for cows,” she says.

Milk production at Eve

Eve Farm is located some 15 km from Nairobi’s exclusive suburb of Karen. Muiruru has 16 cows and is milking seven, which produce 180 litres of milk per day. The milk is sold on the informal sector, which includes a local school and the surrounding community.

Muiruru says the production of milk at her farm is done on the basis of high standard hygienic measures. “We put our customers

first. We make sure that all the milk that we produce at this farm, meets all the requirements and sanitary standards. We check our cows’ udders and the milk is also checked,” she says.

Born to a farming family, Muiruru used to hate farming. Yet she quit her Kenyan Airways ticketing agent job to take up the challenge. She also breeds dogs at the farm and keeps chickens. Compared to other types of livestock farming, dairying can provide a higher income per animal, monthly paychecks and, in many areas, more markets, she says.

“With my entry into dairying, I decided to pursue a ‘herd first’ philosophy, building up my herd before making fixed investments in land and buildings. The reason? Buildings and equipment depreciate. Cows don’t. Cows are also a flexible investment, as they are relatively easy to buy and sell. The ‘herd first’ strategy is a good way to start generating an income while managing your debt,” she advises other would-be dairy farmers.

Start at home

With farmers battling against the twin threats of rising costs and poor farmgate prices, Muiruru says she did her market research and realised that within her community there was high demand for milk.

“The prices within our processing industry are very low, the money comes late and as a farmer I must always have hard cash with me in the event that one of my cows falls sick,” she says.

The local market offers many rewards, as milk prices have become more volatile due to the costs of various inputs continually rising. Muiruru says that for farmers to succeed in this business, they must be willing to consider new ways of doing business. Successful management of a dairy farming business involves optimum use of available resources, land, labour and capital.

Be innovative

“As producers we must be willing to consider some non-traditional or innovative alternatives in handling various aspects of our business. This will include relying on effective and efficient use of available resources.

“You have to set up realistic goals and use a systemic process for decision-making. Gain knowledge about the cost of production and have good record-keeping systems which will allow you to evaluate alternatives and monitor the outcome of your decisions,” she says.

Despite the myth that women lack business savvy, Muiruru’s business has a good survival rate compared to many male-dominated businesses. Her entrepreneurial success is measured by gross sales and market share. Her future plans will see her adding value and investing in the genetic development of her herd.

She says the biggest challenge the continent’s dairy farmers face, is the general lack of proper infrastructure, research, financial and technical support, resulting in many farmers’ future plans not being implemented.

Technical support

She also acknowledges the technical support she is getting from DeLaval officials, that has seen an improvement in her milk harvests. DeLaval dealer, Dr Vincent Masawi, says that with knowledge, you create your own wealth – with aid, you create dependency.

Dr Masawi says that as a company, they are not looking at profits, but rather at developing the farmer with a view to better and efficient production. “A successful dairy sector is not only measured by how many litres are produced, but also by the product quality,” he says.

Dr Masawi, a veterinary scientist, says his company is providing new kinds of products by bringing leadership and innovation to agriculture. **DMA**



- 1 Farm owner, Magdalene Muiruru, and Dr Vincent Masawi of DeLaval at the digester used on Eve Farm
- 2 Milk testing is done regularly at Muiruru’s farm to ensure the best quality milk
- 3 Slurry is a byproduct of the biogas, and is used as organic fertiliser for the production of Napier grass, vegetables and other crops grown on a three-acre plot

Milk money goes mobile

by Fidelis Zvomuya

The national secretary of the Kenyan Dairy Traders' Association, John Wachira, says that Safaricom's M-PESA money transfer system is a great service that has seen milk trading and farmer payments becoming much easier.

Wachira says that smallholder dairy farmers are now being paid swiftly and at a convenient time to them, as traders are making use of a new SMS facility.

The product, called M-PESA, is a Safaricom service which allows one to transfer money using a mobile phone. Kenya is the first country in the world to use this service, which is offered through a partnership between Safaricom and Vodafone. M-PESA is available to all members of the public, even if you do not have a bank account or a bank card.

"We are using our mobile phones in a very entrepreneurial way, as it has become our lifeline, as our small businesses depend on it," says Wachira.

M-PESA ("M" stands for "mobile" and "PESA" is the Swahili word for "money") has become the new technological service that can be easily used by even old people and those who are not educated, but own a phone.

It is estimated that about two million subscribers are using the service since its launch a year ago. It can be used for someone in an urban area to forward money to relatives in rural areas, and people in rural areas can pay off a loan in an urban area without having to travel far.

"You do it instantaneously by SMS," says Gabriel Solomon, senior vice-president for public policy at the industry organisation, GSM Association. "You're having more economic transactions, which stimulate economic growth."

Wachira says it is difficult for many people to get a bank account: "Getting cash can also be difficult in rural areas. It also adds a sense of security."



One has to register for M-PESA in order to send money. Just go to an M-PESA agent with your phone number and ID-book. He or she will upgrade your SIM-card free of charge and then activate the product menu on your phone. To send money, go to an agent and buy M-PESA value by depositing cash. You and the agent will receive SMS confirmation of the transfer.

Go to your M-PESA phone menu and select "Send Money". Then enter the recipient's phone number, the amount and your PIN. You and the recipient will receive an SMS confirming the transfer.

If you are an M-PESA customer, go to the M-PESA menu, select "Withdraw money", enter the agent number, the amount and your PIN. You and your agent will receive an SMS confirming the transfer and the agent will give you the cash. For more information, go to www.safaricom.co.ke **DMA**

Solar ice coolers being installed by technical personnel



Cool solutions for dairy farmers

by Fidelis Zvomuya

In the dairy sector, milk distribution is hampered by lack of refrigeration. Some preservation techniques used are undesirable, resulting in up to 30% spoilage, the introduction of disease vectors, and a significant decrease in nutritional quality.

In Kenya and Uganda alone, losses amounting to millions of dollars per day are reported, with individual dairy consumption below recommended nutritional daily requirement levels. But now Heifer International in Kenya, has come up with the refreshing idea of solar ice coolers.

The idea came to them when Carl Erickson, the managing director of a solar ice company, visited several sites in Coastal Kenya in 2004.

"These sites were basically rural and had no access to electricity supply, making rural refrigeration for dairy and other products difficult. While the morning milk finds its way to the market, evening milk usually goes to waste or farmers do not milk their cows at all for lack of a reliable market and/or cooling facilities," says Alex Kirui, country director for Heifer International in Kenya.

Making up for losses

Kirui says the losses also imply losses of tangible income to the families. Even more so, it defeats efforts to ensure that food security is upheld. In 2006, Solar Ice Company from the US in partnership with Heifer Kenya, with funding from the World Bank, developed a proposal to pilot rural refrigeration technology through the use of solar ice coolers.

This technology taps solar energy to make ice blocks that are used to chill milk or other produce. "We selected two sites for the purpose of demonstrating this technology, which includes Vitengeni in Kilifi and Makambani in Kwale.

"Farmers from these two sites were organised into marketing associations formally registered as Dairy Farmers Cooperative Societies Ltd. The cooperative societies were responsible for housing, selecting machine operators, fencing and water provision," he says.

By May this year each site was installed with three Intermittent Solar Ammonia Absorption Cycle (ISSAC) Solar Units. Each unit is capable of making 50 kg of ice daily. The 50 kg can chill 100 litres of milk each day.

“This technology taps solar energy to make ice blocks that are used to chill milk or other produce”

The bigger picture

The main objectives of the project are to reduce food losses through refrigeration and thus enhancing food security. It also demonstrates the application of the technology as well as empowering rural communities economically.

Currently 181 members of the Kidzo Dairy Cooperative in Makambani and 373 members of the Sovimwamri Dairy Farmers Cooperative at Vitengeni are direct beneficiaries of this initiative. It is envisaged that more will benefit as they join or receive services.

"So far all three units at Makambani are making ice, while only two units at Vitengeni



The ice coolers are able to produce 50 kg of ice per day



Loose-standing parts of the solar ice cooling system before assembly and installation

make ice. Despite the prevailing wet weather, each unit has been able to produce 40-45 kg of ice daily," Kirui says.

At the moment no cooling of milk has started, pending the training of operators and the management of milk quality control and logistics. The purpose of the installation is to preserve milk so that farmers can transport their milk to the market before it spoils. This will increase the income of the farmers and decrease poverty in the area.

This technology will alleviate security concerns relating to poor transport, poorly lit roads, finding buyers and securing reputable buyers.

"The milk to be cooled will come from the members and non-members who are rearing dairy animals within the catchments. A large proportion of the milk is also produced from local cows. Approximately 200-300 litres of evening milk is expected to be cooled every day in each of the two sites". **DMA**