
Emerging innovations in the East African dairy sector

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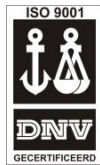
This research was conducted by Wageningen Livestock Research, commissioned and funded by the Centre for Tropical Agriculture (CTA)

Wageningen Livestock Research
Wageningen, January 2018

Report

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The ISO 9001 certification by DNV underscores our quality level. All our research commissions are in line with the Terms and Conditions of the Animal Sciences Group. These are filed with the District Court of Zwolle.

Wageningen Livestock Research Report

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1 Introduction

1.1 Background: emerging innovations for sustainable dairy developments in East-Africa

Dairy is one of the fastest growing agricultural sub-sectors in Eastern Africa, making the region the leading milk-producer in Africa. The region is a buzz for innovations in the dairy sector. However, many of these innovations are not shared with industry actors, or do not influence the value chain widely. This document presents a few innovations in the East African dairy sector that are inspiring examples for further dairy developments in Africa.

Dairying in Southern & East Africa

The East Africa region produces 68% of the continent's milk output, with Kenya, Uganda, Ethiopia and Tanzania among the biggest dairy producers. According to the International Finance Corporation (IFC, 2017), the African dairy sector is projected to grow by 30% by 2025, driven by increased demand for the milk and other dairy products in the continent. This will be the fastest growing dairy sector globally attracting attention to internal and external investors.

Dairy in Eastern Africa is significant in that it is dominated, mainly at production level, by smallholder farmers, accounting for up to 80% of the milk produced in the region. About 80% of this milk is marketed raw, through what is referred to as warm chain (raw milk chain). The demand for milk and milk products have continued to grow over the years due to urbanisation, population growth and improving household incomes. The annual demand growth is estimated at approximately 3.4% - 4%, yet the production growth of milk is estimated at about 2.2% presenting a missed bag of fortunes. This presents opportunities for increasing production and marketing for smallholder dairy farmers, as well as for medium- and large scale farmers and processors to increase supply of processed milk and milk products.

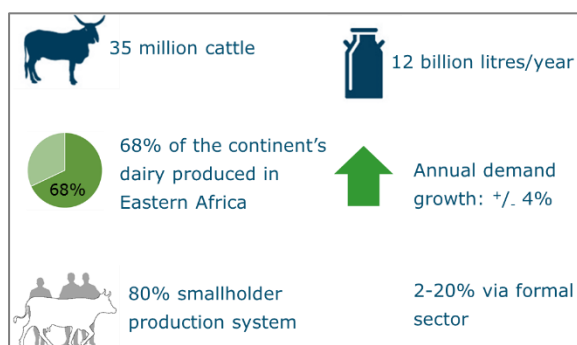


Figure 1: East African dairy in numbers

Some of the main challenges for sustainable dairy development in East Africa are:

- Average productivity is low with Ethiopia and Uganda having an average milk productivity of below 500 kg of milk per cow per year (see also table 1). Meanwhile Kenya and Malawi have a slightly higher productivity of 750 kg/cow/year, which is almost one fifth of Zimbabwe's productivity per cow.
- Poor feeding and herd management is the major contributor to the low productivity. Availability of good quality and quantity feed is low and depend on seasonality, feeding management is a main challenge to improve productivity.
- Poor genetic material also contributes to the low productivity and the absence of a reliable and regulated breeding programs as well as skilled AI technicians in some of these countries poses a great threat to the dairy sector.
- Hence, profitability and sustainability are low (GHG emissions per kg are high).
- With the fast growth in demand, milk quality is becoming a bigger challenge over the years driven by a quick rush to supply the numerous consumers under a situation where the enforcement of quality regulations has a number of loopholes.

Table 1 Dairy indicators for some Eastern and Southern African countries (data collected from: IFCN Dairy Report 2016; 2017)

Unit	Kenya	Ethiopia	Tanzania	Uganda	Zimbabwe	Malawi
Number of dairy cattle (1,000)	6,079	11,833	2,719	5,881	16.0	60
Number of dairy farms (1,000)	1,803	2,605.9	906	2,424	2.1	12
Average farm size (cows/farm)	3.4	4.5	3	2.4	7.6	5
Total milk production per country (million tons ECM*)	4.6	3.34	4.22	2.08	0.06	0.05
Average productivity (kg/cow/year)	750	330	1600	340	3530	760
Percentage of formal milk (delivered to processors)	15%	1.60%	30%	21%	98%	58%
Self-sufficiency ratio in milk (%)	99%	100%	100%	104%	47%	79%
Per capita consumption (kg ME**/capita/year)	127	46	89	47	9	3.3

*ECM = Energy corrected milk (3.3% protein and 4.0% fat). **ME = Milk Equivalents

A growing demand: ground for innovation

The demand for market share of processed milk and milk products has substantially increased, with the entry of multi-national companies in the regional markets in East Africa. The competition among processing companies has led these companies to the door steps of smallholder dairy farmers. The processors main concern is securing a sustainable supply of good quality milk. Development actors too see a great opportunity to increase production and incomes for smallholder farmers through sustainable production and business practices. The dairy sub sector in East Africa has shown a buzz for innovation. Some at nascent stages, while some are at advanced stages. Some examples are increasing milk production while keeping cost of production low; feeding management to address seasonality of milk supply; milk quality and traceability; use of ICT in provision of extension services and new ways of relating with small holder farmers for shared value.

"The largest opportunity in the region is the huge potential to produce large quantities of milk through (simple) improvements"

- Wageningen UR White Gold report (2013)

Highlighting innovations in dairy at ESADA 2017

These innovations, if identified and nurtured well, create impetus for new and sustainable growth in the industry, benefiting dairy farmers and dairy businesses. The current challenge though, is that these innovations are localised in country or a location within a country, are not shared with industry actors and subsequently do not influence value chain practices widely. In recognition of these challenges, the Centre for Tropical Agriculture (CTA), Wageningen Livestock Research and the Eastern & Southern African Dairy Association (ESADA) have joined forces to document and highlight some emerging innovations at the 2017 ESADA Conference, 15-17 November, in Johannesburg South Africa, with a view to show potential of the African dairy sector, to inspire others for working on innovations in dairy and to increase opportunities for bringing current innovations to scale. Innovations create impetus for new growth in the value chain, benefiting smallholder farmers and dairy businesses. The aim is to catalyse wider actions- from simple initiatives to big transformational change within value chains.

This report presents five emerging innovations in the Eastern Africa dairy sector that can bring the (simple) improvements to the sector to increase dairy production and sustainability. The innovations are described with help of the initiators SNV Kenya and SNV Uganda, Fair and Sustainable Ethiopia, African Centre for Technology Studies (ACTS), Agrilife.

ESADA conference

From 15-17th November 2017, various stakeholders in the Dairy industry in Africa gathered in Johannesburg for the dairy conference and exhibition organised by the East and Southern Africa Dairy Association (ESADA) (<https://www.dairyafrika.com/afda>). ESADA has convened this meeting since 2005 bringing together primary and secondary dairy industry actors including: farmers and their organisations, processors, inputs and services suppliers, researchers, government agencies among others. The conference creates a platform for the actors in the region to strategise on how best to drive the development of a sustainable and competitive sector and bolster intra-region trade in order to contribute to economic development and food and nutrition security in the continent.

The theme of the conference was Sustainable Dairying: An African Perspective. The presentations at the conference revolved around key issues that will drive the dairy industry development agenda and included: competitive and sustainable dairying in a global market; Quality and safety; Innovation to support competitiveness and sustainability.

During the ESADA conference five innovations were presented, that you can also find in this report. Innovators of the innovations were invited to represent their innovation during the ESADA exhibition. Videos of the innovation, made on initiative of CTA, were shown during the exhibition and the presentation.

The flyers used presented at ESADA can be found [here](#). The videos can be found [here](#).

1.2 Scaling innovations

The East African dairy sector is a buzz with innovations, however most innovations remain localised and hardly go to scale. Even small improvements have the potential to transform the dairy value chain and increase scale of benefits for all. Supporting innovations that increase (sustainable) productivity and profitability will boost the dairy sector on the continent. For the ESADA conference, it was asked how innovations in the dairy value chain can be nurtured and supported to further shape practices within African dairy.

(Simple) improvements become an innovation, when they are widely adopted. According to Porter (1998), an innovation differs from an invention in that an innovation is a new way of doing things that is commercialised. In this sense, innovation is all about 'turning ideas into cash'. Innovations, or the improvements we are looking for to improve dairy production, do not always need to be disruptive or high tech. Innovations (can) also concern social or organisational improvements in the whole dairy value chain that make the dairy sector more productive, viable and sustainable.

In the past decades, many studies have been conducted describing the innovation process and aspects that influence innovations in agricultural development and/or that can support scaling of innovation (among others, Johansson, 2004; Leeuwis *et al*, 2006; Jacobsen *et al*, 2011; Wigboldus, Klerx *et al*, 2016; 2017). The potential of an invention to become an (commercialised or widely adopted) innovation is influenced by the way the invention is organised. Introducing, adoption and scaling agricultural innovations involves complex interaction between different (f)actors, behavioural and social change. Fruitful innovations often concern aspects of technical nature (also referred to as 'hardware'), social aspects such as skills and knowledge to use the invention ('software') and organisational and institutional aspects (infrastructure, enabling environment; 'orgware') (Leeuwis *et al*, 2006; Jacobsen *et al*, 2011). Rather than replicating the invention in a different situation, scaling requires an integrative and iterative process of finding out what works in one place, and adapt these to another situation/location to ensure responsible scaling (Van den Berg *et al*, 2013). Their project distinguishes vertical scaling processes, also referred to as scaling up, in which the innovation process intends to scale to larger volumes of products or users, and horizontal scaling processes or scaling

out, referring to replication of the invention on a similar scale in a different context (*ibid.*). Although both processes are often linked in practice, it can be helpful to make the distinction when thinking about how an invention can be more widely adopted. Despite the many studies, scaling involves high complexity, and in many cases the success or failure of a scaling project is still a 'black box'. In this respect, Wigboldus *et al.* (2017) call for articulation of a Theory of Scaling, in addition to the often used Theory of Change, to define key assumptions, uncertainties, and connections between actors and factors that can influence the success of an innovation aiming to go to scale.

These theoretical approaches provide useful information on scaling from an analytical point of view and help to gain understanding on the complex aspects involved in scaling innovations. From these theoretical overviews and practical experience, the action research and joint learning initiative PPP-Lab has developed a practical list of aspects ('ingredients') that should be taken into account when working on scaling (PPP-Lab, 2016). These ingredients are, up to this moment, in development and mainly tested in the developed world. However, these aspects make a practical tool when analysing innovations in East African dairy and looking for aspects to support scaling.

1.3 Describing innovations and opportunities for scaling in East African dairy

If we want to know how to support innovations that boost the dairy sector in becoming more productive, we need to know how innovations come about. This is often an unclear process, not all brilliant ideas go to scale (and sometimes less brilliant ideas do go to scale...). Though there are, in a certain context or sector, aspects that can be identified that have played a role in the success of an innovation. To describe the innovations¹ in the East African dairy sector and to support scaling of these innovations, we have used aspects of existing theories to present the innovations and their opportunities for scaling. The aim of this publication is to provide a practical overview of aspects that can influence scaling of these innovations, rather than being a scientific exercise or developing new scientific insights.

Next to describing the core of the innovation, the investments and benefits of the innovation, insights in how the innovation came about and what were hurdles and successes in this process, scaling opportunities for specific innovations, assessing possible negative spill-overs of the innovation when being scaled out to another situation, or negative impact of the innovation if applied by (many) more persons, we analyse the different innovations (chapter three) along the lines of various factors that are described in other literature to find common lessons for future activities. These factors include hardware, software and orgware elements:

- Technology
- Business model
- Financing
- Knowledge, education and awareness
- Value chain development
- (public) sector governance



¹ For clarity, when discussing the cases further described in this publication, we will use the word 'innovations', referring to the improvement, invention, or innovation that is being discussed, independent of the stage of development they are in (and whether it formally still is an invention or an innovation).

2 Emerging innovations in East Africa dairy

This publication describes five emerging inventions or innovations in the East African dairy sector. These innovations were selected out of a longer list of innovations in the dairy sector of East Africa. The innovations selected originated from different countries, target different parts of the dairy value chain and are each in a different stage of their development.

Each innovation is described in this report along the same lines:

- *Describing the innovation*: the novelty of the innovation in terms of improvement of the conventional situation or the challenge the innovation is responding to, what the innovation entails and how the innovations works, who the users are, and the benefits and investments made.
- *Realising the innovation*: as many innovations depend on the efforts of an individual with an ambition or dream, this chapter describes how the innovation was initiating and by whom, and how the innovator came from idea to practice, the social and organisational changes that were needed and the hurdles and successes taken to realise the innovation. For some cases a personal story of the innovators are included.
- *Scaling the innovation*: a chapter describing the applicability of the tool for next users, drivers that could enhance scaling and the expected impact if the innovation is being scaled up and out.

Please find below an overview of the innovations described in this chapter (please use hyperlinks to go directly to the chapter of your interest):

1. [Mobile ICT-tools to analyse dairy profitability, Kenya](#)
2. [Private dairy advisory service, Ethiopia](#)
3. [Youth-led Service Provider Enterprises, Kenya](#)
4. [Practical Dairy Training Farms, Uganda](#)
5. [Milk vending machines, Kenya](#)

More information on the organisations or projects from which the innovation originate can be found in [chapter 4](#).

Input for the innovations descriptions is provided by initiators of project partners who were closely involved in realising the innovation, see [chapter 5](#).

Phases of development of the innovation

Best practice: measure has been successfully implemented in diverse contexts, next step is scaling up.

Pilot: Pilot project has been carried out, next step is commercial development.

Proof of concept: the measure has been demonstrated in an experimental setting, next step is a pilot.

Discovery – exploring promising concepts for future proof of concept.

2.1 Mobile ICT-tools to analyse dairy profitability in Kenya: DairyNomics



Making farm economic performance results visible to support farm decision-making and link farmers to input suppliers

The cost of milk production of individual dairy farms – and their profitability and the breakdown of different cost components - are often unknown in Kenya, likewise in the rest of East Africa. The lack of record keeping by most farmers makes it more difficult to determine and analyse these costs. Without understanding the cost structure, it is hard to make sound management decisions that could increase the profitability and viability of the dairy enterprise. Mobile ICT tools can help farmers progressively record farm data, and generate farm economic performance results which support their daily, short-term and long-term decision making. There are different ICT tools developed to support farmers in their business operations. This chapter discusses the ICT tool DairyNomics as an example.

Facts & Figures

- ✓ Developed & tested in Kenya, applicable in all (East) African countries.
- ✓ Applicable to smallholder, medium- and large-scale dairy farms; and to different dairy farming systems (from zero-grazing to pasture grazing).
- ✓ Piloted on 20 dairy farms in Kenya, for 4-6 months.
- ✓ Feeding costs were identified as the highest component of the cost of production, reaching 67% to 138% of the milk price
- ✓ 50% of the farms piloted adopted the tool in their daily management.
- ✓ Investment costs for purchasing the tool: estimated around 20USD per farmer. Dairy advisor: 20-30 USD per visit.

The information on DairyNomics is developed based on input from Jasper van den Brink & Anton Janssen (SNV Kenya)

2.1.1 Describing the innovation

The challenge: Need for improved record keeping

The cost of milk production of individual dairy farms – and their profitability and weight of different cost components - are often unknown in Kenya and East Africa. Without understanding the cost structure, the profitability and viability of a farming enterprise it is hard to make the right management decisions in order to sustain a future business. Dairy farms are subjected to high prices of animal feeds and (poor quality) fodder, calving intervals are long and cow management skills of farm owners and managers is low. In Kenya, dairy business might not be as profitable as many would think, in spite of the relatively high prices paid for raw milk. In order to help farms in their daily decision-making, they need support to enable them understand their financial status and cost structure and the profitability of their enterprise. ICT tools have a high potential to support farmers in their daily management decisions.

DairyNomics is a comprehensive tool developed to analyse financial performance and profitability of dairy farms in East Africa. It comes with a “stand alone” total farm recording solution to help farms in keeping records, analysing data and receiving practical advice. The expertise of a trained consultant is required in order to fully use the potential of both the Web version as the downloadable DairyNomics App.

How it works

DairyNomics analyses data based on monthly costs and revenues. Therefore it captures the actual production cost per liter of raw milk. In order to analyse the farm performance, record keeping is key to success. With the total farm recording solution, farmers are guided to record all costs and revenues on a monthly basis. As part of this, all feedstuff need to be weighed to compute actual feed cost per month. DairyNomics delivers reliable results based on monthly monitoring of inputs and outputs of the dairy enterprise. The breakdown of cost is benchmarked with international standards or key performance indicators, which guides the farmer and the dairy advisor on the priority areas for farm interventions.

Users

DairyNomics will help farmers to understand their cost structure and profitability and support them with the right information for operational decision making. The tool on its own will be used by dairy consultants in order to be able to better advice farms to improve their profitability. Secondary to the concept is the possibility of aggregating individual farm data into a larger database. If farm owners allow farm data to be aggregated, this can be used for research purposes and sector analysis. Also input suppliers and service providers (including financial institutions) can benefit from such a databank.

Investments & benefits of the innovation

Investments	Direct benefits
✓ Technology: trusted recording and analysing tool	✓ Reliable breakdown of production cost after 1 month of implementation at farm level
✓ Technology: Purchase of mobile ICT tool & related services	✓ Comprehensive understanding of farm viability and profitability, Performance benchmarked.
✓ Knowledge: understand the concept and importance of accurate record keeping	✓ Leading to identification of key intervention areas for improvements at individual farms
✓ Behaviour: Accurate farm recording & follow-up management advice	✓ M&E of farm financial performance
✓ Service provision: skilled advisor to analyse data and support farmer	✓ M&E of farm herd performance
✓ Time: data recording and analysis	

2.1.2 Realising the innovation

Initiating the innovation

DairyNomics is an initiative of SNV's Kenya Market-led Dairy Programme (KMDP), with the objective to get more reliable insight in the cost price of raw milk production and the cost structure and profitability of dairy farms in Kenya. In order to develop a tool for the Kenyan market it is key to understand the market needs. In this case the tool must generate useful information for a farmer in order to improve the profitability of his dairy business. The project took an annual profit and loss calculation tool for dairy farms developed by QPoint from the Netherlands, as basis for developing the DairyNomics tool. After tailoring it to the Kenyan situation and needs it has many different features, including a complete set of farm recording modules and an App.

To develop DairyNomics from an Excel program into a downloadable App, a local ICT company (Acculynk Systems) was contracted by SNV KMDP to design and maintain a web based version and downloadable App of DairyNomics. Record keeping modules were developed through the KMDP project. The DairyNomics tool now records, enters and analyses all costs and proceeds at farm level on a monthly basis uses a monthly profit and loss account.

From idea to a practical tool

But a great idea is not yet an applicable and easy to use practical tool. During the DairyNomics development there have been two pilot phases. The first pilot phase was to test the applicability of the tool and the user-friendliness for both the dairy consultant and the farmer. Once this was achieved, a second pilot phase of 8 months was conducted in order to measure the impact of the tool by assessing if and how it actually helps to improve profitability or support farmers. The project needed dedicated farmers and dairy advisors or consultants to go through this process together. Constant reflecting and monitoring on progress was part of the weekly sessions of the farmers and their SNV DairyNomics consultants. Monthly were organised to report back on experiences and learnings. With this bottom-up approach the actual applicability and user-friendliness of DairyNomics was developed by farmers and dairy consultants, which is key and needed to successfully realise the innovation.

Social and organisational changes

The basis for DairyNomics is accurate and reliable data. Without reliable data the analyses outcome will not be useful. This requires some organisational and behavioural changes at farm level, where all farm staff need to understand the concept and importance of record keeping, and have sufficient discipline to do meticulous farm recording. This also brings in a high level of transparency in farm operations, costs and proceeds, which may not always be in the interest of farm managers. Adoption and willingness of farmers to keep records is encouraged especially when they are interested in meeting their targets and see the dairy farm as an enterprise. This often requires a change of mind set of the farm owner and (if present) the farm manager and other workforce on the farm. There needs to be an urge to run the dairy enterprise as a business and – apart from keeping records and “feed” the system – there needs to be follow-up and willingness to change operational management and make improvements across all farm operations, if and as required based on the outcome DairyNomics analysis of farm performance. To actually realise impact on the farm, change should be embraced and adapted in order to improve the farm viability. As much as the tool helps the farmer to understand performance and where to intervene, the tool as such does not implement the changes by itself.

Hurdles and successes

People in general do not like to be told what they are doing wrong. Many people prefer to ignore the limiting factors in their farm and only enjoy the minor successes. We have seen that people are afraid of a negative outcome after analysis of farm performance and profitability with DairyNomics because running at a loss isn't seen as a success. But the great thing is, that it will help the farm to understand their limiting factors and improve them to become profitable and successful.

To successfully implement and utilise the potential of DairyNomics, daily record keeping is necessary. Without the right data the outcome of any analyses will be worthless (garbage in, garbage out). Willingness and transparency in information sharing is key to really understand a farm business and to

make the right decisions. Farmers will often tell about their few high producing cows “my cows are producing over 30 litres per day!”, but what they don’t tell is that this is not the average production level for the entire lactation, their calving intervals are very high, and thus they also have to take care of many low producing cows with the outcome that the farm is running at a loss. The low average production per cow in Kenya isn’t because cows are not able to be high producers. It is mainly because of poor cow management and feeding regimes of cows and calves, and the huge calving intervals that cause the low average milk production of the total herd of mature cows. In order to become profitable dairy business, a calving interval of 400-420 days is required and achievable, but mostly this is closer to 500 days in Kenya. DairyNomics makes these gaps visible and relates this to lost income and low profits (or more than often no profits at all)

Key to success is to involve several stakeholders in the development of the tool. Generally speaking this is always the case; what seems to be a great idea might not be something that people want or actually need. DairyNomics has been developed based on the experience of Kenyan advisors, experts and farmers. It was pegged on their desire for better performance of their business, and the need for a relatively simple and user friendly tool that moved SNV to drive the development of DairyNomics.

Meet the innovators

The DairyNomics project kicked off in 2016 through the engagement of a Dutch student from Vilentum Agricultural University of Applied Sciences in Dronten, the Netherlands, Mr Jasper van den Brink, being coached and technically backstopped by an expert from PUM/Netherlands Senior Experts, Mr Frans Ettema, under the KMDP-PUM partnership.

“During the development I realised how much impact the tool could generate and how it could really affect peoples’ lives”

- Jasper van den Brink

Jasper commenced on a 4 months internship for his thesis at Vilentum Dronten. During this internship the tool was designed in Excel on international financial accountancy principles. After his 4 months internship and graduation at Vilentum SNV offered Jasper a follow-up contract as a consultant to further develop and test the tool in 20 farms (smallholder and medium scale) which resulted in the final product that was delivered in August 2017 (farm recording worksheets, calculation model and the DairyNomics App).

Jasper van den Brink: “During the development I realised how much impact the tool could generate and how it could really affect peoples’ lives. And in order to create that impact DairyNomics needed a follow-up project for it to become successfully and widely used instead of turning into just another great idea ready to be stored in an archive and never to be found back again. It was during this 4 month internship where I realised that social impact – founded on healthy economic and business principles and opportunities - is one of my personal key pillars in order to achieve professional success. Once I understood the great potential of the tool I wanted to be part of the next steps to create a product that would be scalable and commercially sustainable. I strongly believe in a demand-driven commercial approach where solutions to real problems are provided through innovative products, technology and knowledge. That’s the only way to sustainably improve agricultural value chains and really improve livelihoods.”

“What motivated me to keep working on the project is the **‘lead farmers approach’**. By focusing on the farmers who are dedicated to run their farms as a business and to improve operational management and practical skills we have seen a big footprint of the tool in most farms that were part of the pilot. In addition, there was an important spill-over to neighbouring farms in the community, who adopted similar practical improvements but were not or did not desire to be amongst the group of pioneers or early adopters. What happens is that a few farms can create a big impact because they are willing to share with peers in their communities who then adopt and replicate visible and measurable improvements.”

2.1.3 Scaling the Innovation

Applicability of the tool / next users

The DairyNomics tool can be applied by smallholders, medium and large scale farms, in and outside Kenya, and for different dairy farming systems (from zero-grazing to pasture-grazing). Some adjustments/adaptations may be required in standardising comparisons across farm sizes, systems, counties and cultures. Hence, in theory, the tool can reach thousands of farmers and dairy advisors. The farm record keeping modules can be used as a stand-alone product for those users who do not want to use the DairyNomics calculation tool, or who cannot afford or have no internet access, smartphone or computer.

Currently SNV KMDP is exploring possibilities with several parties (research/training institutions and private sector) to develop a route to market through custodianship and/or commercialisation of the DairyNomics tool, in order to scale up, reach as many as possible users (in and outside Kenya) and contribute to sector information, for example for improved policy making.

Preferably DairyNomics is commercialised by a private company that specialises in ICT and software solutions for enhanced dairy farm and herd management to guarantee sustainable "route to market". In order to use the App and to advise on practical implementation a dairy advisor who is familiar and well known on how to use DairyNomics is best placed to use the tool and advise the farmer.

Drivers for scaling

The demand in the market for DairyNomics and similar tools is expected to be driven by ongoing commercialisation of dairy farms, followed by the need/desire for understanding of cost factors and performance and profitability, and the need to reduce cost price of milk for sustained operations. Successful implementation and utilisation of DairyNomics potential depends on farmers being in dairy as a business, discipline to do meticulous farm recording, transparency and willingness to share objective information about financial and herd management performance. The role of lead farms is helpful in adoption of the tool and changing mind-set.

On the supply side, the provider of the tool needs to make visible the added-value of the tool, by showing that users of DairyNomics were able to enhance performance and profitability in a relatively short time span and thus create tangible impact. Access to internet is another requirement although the App can also be used offline, and the farm recording modules can be used manually as well as stand-alone product.

Ideally scaling this innovation is driven by a professional company with roots in the dairy sector specialising in farm and herd management software. Marketing through dairy cooperatives and milk processors is a good entry point. The scalability depends on creating awareness and demand in the market, amongst others by showing increased performance of farms using the tool. If farm owners allow, farm data can be aggregated into a larger database and used for research, market intelligence and sector analysis.

Expected impact

The DairyNomics tool is expected to result in informed and better decision making at farm level on cow and feed management, which will lead to higher productivity per cow, lower cost price of milk and enhanced profitability and competitiveness of the dairy value chain. This in turn will result as well in a lower cost price of milk and dairy products for the consumer. Thus contributing to improved livelihoods of farmers, higher affordability of milk to BoP urban consumers, food security and nutrition. In addition, a more competitive dairy sector has more opportunity to grow and attract investors and credible input suppliers and service providers, such as feed suppliers, AI technicians, farm machinery and implements, milking machines, etc.

Another impact of wide use of the tool can be to connect different value chain actors. If farmers approve, farm data can be aggregated into a larger database and used for research and sector analysis.

Positive side-effects on wider environment

- ✓ Enhanced competitiveness and sustainability of the dairy sector or dairy value chain
 - ✓ Improves knowledge on and production of quality roughages, fresh and preserved and productivity per land unit and per cow,
 - ✓ Potential to reducing environmental impact per litre milk
 - ✓ Creates jobs at dairy farms and for all other relevant stakeholder in the dairy value chain
 - ✓ Farm profitability will contribute to higher involvement of young people in the dairy sector
 - ✓ Aggregated data in large database allows for sector analysis and connecting different value chain actors.
-

Example of other ICT tools for dairy management: NewKCC

The New Kenya Cooperative Creameries (NKCC) tool is developed by Agrilife and uses cloud technology integrated to mobile & web platforms to facilitate linkages between farmers and other value chain actors and to ease farmer groups' monthly payments. It has a stud book recording system for farmers, their location, their animals as well as resources and animal performance. The tool works through the facilitation of Dairy Farm Assistants who visit the farms weekly, record farm data and issue purchase orders for any required farm inputs and services. The purchase orders are directly transmitted to a central platform and then channeled to the nearest approved supplier who guarantees a timely delivery. Payment is either done in cash or through a credit scheme. The Dairy Stimulus Package (DSP) is a new initiative integrated in this tool which aims at offering a loan package to farmers to access inputs/services using the Agrilife platform. The Agrilife innovation is for the entire dairy value chain actors & other stakeholders: primary targets are the farmers/farmer groups, then processors such as NKCC. Secondary value chain actors are financiers, input providers, insurance companies and transporters. Other dairy industry stakeholders are industry regulator (KDB), academia institutions and governments.

In the DSP initiative the Dairy Farm Assistants (DFAs) take the role of linking the processor (NKCC) to individual dairy farmers and also manage & report their farm-level events. On-boarding of the insurance companies to offer products to dairy farmers is also included while the tool also offers possibilities for stakeholders such as academia and County governments to access aggregated data in real-time for research and policy making.

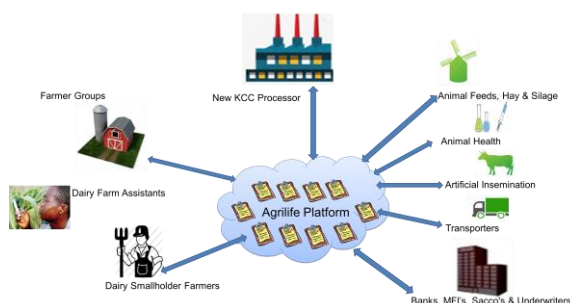
In the new DSP initiative in NKCC system, the total business value is estimated to be KES 3billion (USD 30million) through transactions in fodder, artificial insemination, animal health, cow tagging, insurance and payments. In DSP the target is to register 30K farmers, 150K cows. Currently the registered farmers in Agrilife platform are 15,100 farmers in about 150 farmer groups. The number of DFAs needed is 200 in the entire NKCC system for the entire country.

The idea for NKCC was borne in 2011 by one of the directors of Agrilife Limited (at the time he was a director in Mobipay Kenya Limited). The aim was to leverage on cloud technology to facilitate payments in the agriculture sector at very affordable costs. In 2011 the EADD (East African Dairy Development Project) was started and Mobipay was sub-contracted to offer a payment-gateway from which dairy farmers would be paid in real-time based on milk delivered. Once Mobipay was sub-contracted, the Agrilife platform was developed to facilitate payments in the agri-sector though started in the dairy value chain.

Challenges and opportunities

- The use of cloud technology integrated to mobile & web platforms are the new inclusions to facilitate farmer groups' monthly payments.
- The DSP initiative is new which aims at offering a loan package to farmers to access inputs/services using the Agrilife platform.
- In the DSP initiative the inclusion of the DFAs is new: and they take the role of linking NKCC to individual dairy farmers and also manage & report the farm-level events.
- On-boarding of the insurance companies to offer products to dairy farmers is new and also the welcoming of stakeholders such as academia and County governments to access data in real-time for research and policy making is new.
- The immediate impact is automation of farmer payments which has 'removed' the delay on monthly payments to farmer groups.
- There is an introduction of advance payments on request, to farmer groups within the month based on delivered raw milk to NKCC Plants.
- The DSP initiative creates new jobs (DFAs) who are mainly the youth (below 30years) and who earn commissions from Agrilife platform.

SCHEMATIC ILLUSTRATION OF AGRILIFE SOLUTION



2.2 Private dairy advisory service in Ethiopia



Contributing to professional and high-quality advice to large-scale dairy farmers.

The increasing demand for dairy products in urban areas is stimulating investments in the development of medium and large-scale dairy farms. However, proper knowledge and skills to manage these larger farms is hardly available in Ethiopia and productivity is lacking behind. Lack of both technical and practical knowledge has been affecting the dairy sector both at farm as well as at extension levels. The pilot on Private Dairy Advisory Services contributes to professional and high-quality advice to large-scale dairy farmers.

Ethiopian dairy farmers mainly receive advisory services from Government hired development agents (DAs), who are not always adequately trained and equipped with practical knowledge and advisory skills to support medium- and large-scale farms. The pilot worked on establishing private initiatives/companies offering dairy advisory services to medium-and large-scale dairy farms.

Facts & Figures

- ✓ Total number of advisers trained in DairyBISS: 54 (upto july 2017)
- ✓ Number of dairy advisers in pilot: 9
- ✓ 30-40 medium-scale farms included for on-the-job training during the coaching trajectory .
- ✓ Willingness to pay for farm advice increased: 20% of these farms started with payment for advice and services
- ✓ Costs for hoof trimming service: USD 5 / cow
- ✓ Costs of weekly on-farm advice: USD 95 / month
- ✓ Full-time on-farm dairy advice: USD 600 – 700 / month
- ✓ 1/3 of total advisers generate income due to training by the end of 2016

This chapter is developed based on input from Fair & Sustainable Ethiopia

2.2.1 Description of the Innovation

The challenge: lack of high quality dairy advisors

Ethiopia has the largest livestock inventory in Africa, but productivity is not yet satisfactory. Particularly, lack of both technical and practical knowledge has been affecting the dairy sector both at farm as well as at extension levels. Dairy farmers mainly receive free advisory services from Government hired development agents (DAs), who are not themselves adequately trained and equipped with practical knowledge and advisory skills. A government DA offers support regarding artificial insemination (AI), but his knowledge about proper dairy housing maybe limited. A veterinarian diagnoses and gives medicine, but may fell short in providing advise on how to keep records or about feed and feeding. That was the challenge for many dairy farmers in Ethiopia. Even in areas dominated by livestock production activities including (animal science) colleges (such as Bishoftu) comprehensive dairy advisory and technical service is not easy to get.

How it works

The pilot introduces private pay-for dairy advisory services to the dairy sector to assist small, medium and large scale commercial dairy farms in Ethiopia achieve quality production and organised farm management.

Advisors in the pilot have been intensively coached with on-the-job farm advice. Communicating, connecting and promoting the innovation was as equally important as producing adequate dairy advisors. Next to training in technical aspects, learner advisors were coached to acquire business cards, obtain attractive brochures, and start to introduce their advisory services to medium and large scale dairy farms in towns around Addis Ababa.

The dairy advisors currently present their services to dairy farmers and dairy farm managers. This can be for practical services (i.e. hoof trimming services) as well as long-term on-farm dairy advice. They are based in Bishoftu, Sululta, and Sendafa - where dairy farming is intensive and the need for better dairy practices is high. Dairy housing, feed and feeding, hoof trimming, breeding, calf rearing, hygiene and milk production, health care, and record keeping are the major advisory and technical services they provide.

Users

This innovation is of main interest for dairy farmers seeking high quality advice. Commercial dairy farmers are most likely to benefit from the private advisory service, as they can increase their profit and have a return on their investment in advise. Industry actors, governments and non-governmental organisations working in dairy development can also benefit from the advisory service.

Investments & benefits of the innovation

Investments	Direct benefits
✓ Knowledge & Skills: invest in gaining technical and practical knowledge on dairy advising, including hiring experts to give trainings	✓ High quality advice to dairy farmers that will increase productivity and profitability of the farm
✓ Business model: develop a good business model for advice, show added value, create demand	✓ More awareness on animal welfare issues in relation to production
✓ Behavioural change: willingness to pay by farmers for high-quality advice	✓ New business model for advisory service
✓ Develop standard for high-quality advice	✓ Income generation for advisers
✓ Technology: hoof trimming chute imported	✓ Employment and entrepreneurship

2.2.2 Realising the innovation

Initiating the innovation

The Private Dairy Advisory Service Pilot was started under the umbrella of the Dairy Business Information Service and Support project (DairyBISS), implemented by Wageningen Livestock Research and funded by the Embassy of the Kingdom of the Netherlands in Ethiopia from 2015-2018. The main objective of the DairyBISS project is to stimulate commercial dairy sector development, through establishing a dairy business platform, developing dairy business information, and setting up capacity building activities and introducing private dairy advisory service. To that end, DairyBISS has engaged in numerous activities, including training and certifying 54 dairy advisors.

From idea to pilot

The Private Dairy Advisory Service Pilot aimed to test the possibilities of establishing private initiatives/companies offering dairy advisory services to medium and large scale dairy farms. Fair and Sustainable Ethiopia, designed and implemented the pilot. F&S started with understanding the knowledge gap in all aspects of improved dairy production, such as farm management, feeding and feed preparation, housing and environment, milk production, handling and marketing, breeding and reproduction, and health. A next step was to select learner advisors who were willing to participate in a pilot with only a small monthly stipend. In 2016, nine learner dairy advisors started the journey of training in technical knowledge in dairy production as well as analytical and advisory skills.

Learner advisors are selected based on their educational background and experience in the dairy sector. While a few of them own their own dairy farm or have been working on dairy farms, many of them are just BSc or MSc graduates in animal husbandry. In 2016, they participated in 7 short term training modules in dairy production and business organised by the DairyBISS project. They, however, still lacked the qualities of being a good dairy advisor in terms of practical experience, farm analytical and advisory skills. In addition to a on the job coaching trajectory, it was decided to add specific training focused on gaining practical experience.

Nardelli Dairy Farm, located at Bishoftu, made its farm available for practical dairy advisory training and the learner advisors were able to observe, practice, and evaluate every aspect of dairy farm management and production. Besides, every week the learner advisors have been visiting at least two other dairy farms either in Bishoftu, Sendafa, or Chancho to actually identify problems and to practice providing advises to dairy farmers.

Social and organisational challenges

The fact that most learner advisors barely had any hands-on experience of dairy farm management and the absence of basic practical training provision in the country was a major challenge. After exploring various options, an arrangement was made with Nardelli Dairy Farm in Bishoftu to organise an on-farm training for learner advisors in exchange for farm advice and hoof trimming services. Thanks to over 2 dozen of dairy farms in different cities who let their facilities to the purpose, the on-farm training gave the advisors an opportunity to gain evidence based lessons.

The pilot's main challenge is for farmers to go from free public advice to pay for private advisory service. For the advisors, this also requires a business-minded approach. The pilot's first results show that awareness of dairy farmers on the value of high-quality pay-for advice has

Hoof trimming

Previously, a few veterinarians were doing hoof trimming by strangling the cow down on the floor and it takes many men to do that. Even big commercial dairy farms in Ethiopia do not have relevant tools such as a hoof trimming chute or trimming tools. For complete realisation of the hoof trimming services, trimming tools were imported from the Netherlands.

"The previous practice, not only discomforts the cow but could also seriously affect its health", Mr. Abebe Tessema explains. "Now, both the dairy farmers and dairy farm owners around Bishoftu are very happy to see the cow-friendly chute and eager to adopt the technology."



Meet the innovators

On one Friday, in Bishoftu, around 45KMs southeast of Addis, Wondewesen Kebede is providing hoof trimming service to a dairy farmer. While gently trimming the claws, he informs the farmer about the benefits and the negative effects otherwise. "Cow comfort is directly related to milk production, and if the hoof is not frequently checked and trimmed, it affects the cow's physical formation and may even result in lameness." Wondewesen is one of the private dairy advisors trained and certified by DairyBISS, and who went through the dairy advisory service coaching trajectory provided by Fair and Sustainable Ethiopia.

"We are also learning the techniques on how to approach and explain to dairy farmers about the situation on their dairy farms"
– Abebe Bereda, learner advisor

Mr. Tassew Kassa is one of the first clients of the dairy advisors in Bishoftu. He thinks the price they request is not only affordable but also worth paying. He says it has been very difficult for him and other farmers in the town to find the kind of professionals who provide all sorts of dairy advisory and technical services. "Take this hoof trimming service, for example", said Mr. Tassew. He was present when Wondewesen provided the service to another farmer. "I was about to sell my cow to be slaughtered for meat because she was struggling with her badly grown claws. Now she gave me a calf, thanks to Wondewesen and his friends."

Mr. Tassew is now more than a client, he has become an advertiser for the advisors and brings them more advisory jobs. In fact, he came to meet Wondewesen that day to arrange an advisory and hoof trimming appointment for another farmer in the town for the next Saturday.

Zelalem Kebede owns her own dairy farm and she is now ready to become a dairy advisor to fellow farmers. The practical training has been an eye opener for her: "I realised how my dairy barn has been uncomfortable for my cows; now I know how I can provide comfort to my cows and increase my dairy production, and also how I can easily advise other dairy farmers."

Abebe Bereda, another learner advisor, who is also a PhD candidate at Debre Berhan University, describes the training as more than learning the practical challenges and solutions of dairy farm management. "We are also learning the techniques on how to approach and explain to dairy farmers about the situation on their dairy farms."

Mr. Abebe Tessema, a senior consultant in the dairy sector, leads the advisory training and other selected trainers were invited by the project to coach the learner advisors on specific subjects, such as hoof trimming or communication: "They are university graduates with good theoretical knowledge, but this on-farm training helps them to acquire practical experience and to become excellent advisors." Mr. Abebe keeps timing their milking speed, shows them how to examine cow health and nutrition through manure evaluation, and takes them to different dairy farms to practise providing dairy advices.

increased, and a start has been made with payment for the advice and services of the trained dairy advisors.

Many larger farms however, are owned by an investor not present at the farm itself (living in town), daily managers often lack decision making power, which hampers advisory work.

Hurdles and successes

A number of private dairy farms have played a significant role in realising the innovation. They opened their dairy farms in exchange for free dairy advises, hoof trimming service, and concurrent training for their staffs. Especially the hoof trimming service triggered demand because of its **direct visibility**, which is important in such a new advisory based service.

There are also a few, like Nardelli Dairy Farm, that went beyond to adopt and in-house manufacture a hoof trimming chute based on the one imported from the Netherlands for the purpose of the project.

Identifying and selecting proper learner advisors who would be willing to participate in the pilot project with only a small amount of monthly stipend was one of the challenges. Some of initially identified learner advisors were focusing on short term benefits rather than the long term goal of becoming well qualified private dairy advisors. As a result, reselection was necessary and implementers made an effort and succeeded in finding a core group of energetic and passionate learner advisors.

Besides gaining technical expertise, skills on communicating, connecting and promoting the innovation was as equally important as producing adequate dairy advisors

2.2.3 Scaling the innovation

Applicability of the innovation and next users

Private advisory service in Ethiopia's dairy sector is rather new, and hence, might need time to be accepted by farmers, and for potential advisors to take the step for making the investment for training. However, the enormous gap in practical hands-on knowledge and skills in dairy advice, and the increasing demand for milk, offers opportunities for the private advisory service to be scaled. Once the effects of high quality dairy advice are demonstrated, demand for such advice will increase.

Scaling up on the long term (integrate hands-on experience and training in curricula at different levels) vs on the short term (coaching trajectory, for example for farm managers/farm managers to be, farm staff, for unemployed potential advisors) is needed to further develop good quality advice.

Drivers for scaling

Visibility of the benefits of the advisory service is one of the main drivers to contribute to the success of private advisory services. Combining the advisory services with practical issues such as hoof trimming, increases visibility and trust in the advice of the advisor.

Using larger or lead farms for practical training makes the added value of advisory services visible. This also enhances demonstration of the success of private advice can support the further development of private dairy advice.

Private advisors need to be well-trained in technical knowledge and advising skills. This is of utmost importance for the success of the service. A standard can contribute to the appreciation of private advisory service and to prevent a proliferation of advising services

Expected impact

Scaling-up of private dairy advisory services in Ethiopia will benefit the development of the commercial dairy sector in Ethiopia. High quality advice on several aspects of dairy production can also improve profitability, efficiency, cow welfare situation, cow health, and milk quality.

Positive side-effects on wider environment

- ✓ More knowledge on the gaps in terms of knowledge and skills of the sector both at advisor and farm level
- ✓ Affordable dairy advisory and technical service for dairy farms
- ✓ High level of youth involvement
- ✓ Technology transfer

2.3 Youth-led Service-providing Enterprise in Kenya



An innovative business model that offers commercial dairy support services to entrepreneurial smallholders & medium scale farmers.

The Service Provider Enterprise model (SPE) is an innovative youth-led business model in which young men and women as groups offer commercial dairy support services to entrepreneurial smallholders and medium scale farmers. The focus point of current SPEs is silage making for (dry season) feeding, in combination with advisory support to dairy farmers on feeding and dairy cow management.

Facts & Figures

- ✓ SPEs are group agri-enterprises of between 3-6 local youth
- ✓ Currently 30 active SPEs in at least 6 Counties in Kenya, with 160 local youth self-employed in service delivery.
- ✓ SNV trained over 200 youths from 25 SPE groups, part of these were trained and formed in 2017
- ✓ A recent study of 8 sampled SPEs operating in three regions found:
 - SPEs charge farmers between US\$ 4.50 to 10 per tonne of silage
 - SPEs under the KMDP project have provided various services to about 5200 farmers in the years 2015 and 2016
 - They made an estimated 11,200 tonnes of silage in 2016, mostly maize
 - Against an equivalent of US\$50,300 in cumulative business volume for the SPEs.

This chapter is developed based on input from African Centre for Technology Studies and SNV Kenya

2.3.1 Description of the innovation

The challenge

Good quality feeding enhances productivity and sustainability of dairy cows. Access to sufficient and quality fodder is a challenge for Kenyan dairy farmers, both with respect to on-farm fodder production and preservation. Especially in periods with drought, lack of feed and fodder can be a huge challenge for dairy farmers. This results in reduced availability of milk during the dry season.

The Service Provider Enterprise (SPE) is an innovative youth-led business model in which young men and women offer commercial dairy support services as groups to entrepreneurial smallholders and medium scale farmers. The value proposition of SPEs is first, to enhance access to quality and affordable fodder, and offer other advisory support to dairy farmers related to feeding and dairy cow management. Fodder contributes to 65% of the cost price of milk. By addressing the fodder challenge SPEs seek to contribute to dairy farmers' livelihoods and to the growth of the dairy industry in Kenya.

How it works

The innovative SPEs are groups of between 3-6 young men (mostly) and women that are strategically located in major milk-sheds in Kenya, that seek to become the next door solution providers on fodder preservation, fodder establishment, supply of fodder seeds and other inputs and training and advisory service on dairy cow management (e.g. feed formulation, rations, calf rearing, record keeping and breeding). The innovative aspect of SPEs is how the youth groups have established agro-enterprises offering contracted services to farmers who are willing to pay to enhance their access to affordable and quality fodder. The group introduces farmers to new fodder crops and feed management strategies through training and demonstration in partnership with dairy farmers' cooperative societies (DFCS) that operate as collective bulking enterprises. The DFCS provide an important for SPEs to reach to their prospective farmer clients. The SPEs offer a bundle of services in order to diversify their business (see figure 1). SPE are innovative in how they seek to tap into the potential of educated youth in providing knowledge-intensive support to entrepreneurial farmers, and complementing other existing public and private training and extension services.

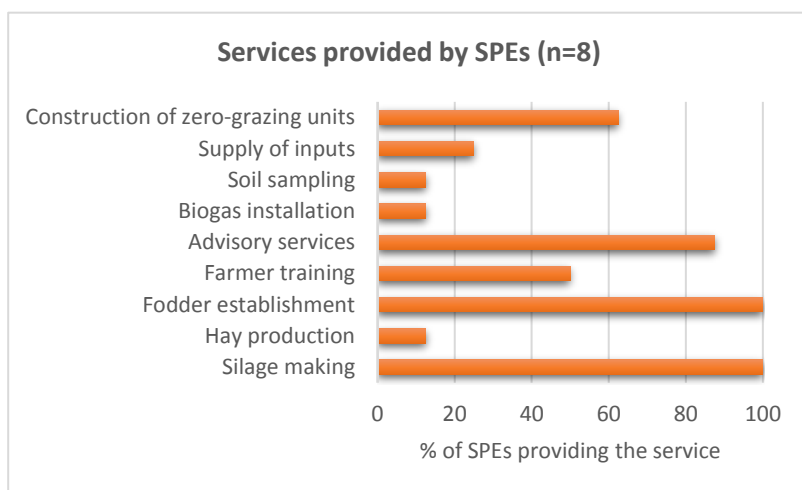


Figure 1: services provided by 8 SPEs

Users

The innovation mostly target smallholder and medium-scale entrepreneurial dairy farmer in the high dairy production regions in Kenya including in Rift Valley, Central and Eastern Highlands. The groups offer a bundle of services to small and medium scale dairy farmers most of whom are members of dairy farmers' cooperative societies that collect, bulk and market their members collectively. In 2016, the sampled SPEs has provided various services to about 5200 farmers of the respective DFCSs that worked with the SPEs.

Investments & benefits of the innovation

Investments	Direct benefits
✓ Knowledge: silage making, advisory & business skills	✓ Youth employment and sustainable incomes
✓ Technology investment: choppers, chuff cutters	✓ Higher availability of feed in dry season & decreased feeding costs resulting in low cost of production
✓ Behaviour change: Willing to pay for support services	✓ Increased milk production
✓ On-Farm investments: technology, structures & materials.	✓ Increased farm incomes and growth in sustainable and competitive farming enterprises
✓ Business relations: link farmers & SPE; incentives to members; build loyalty with buyers	✓ Increased and consistent milk collection at DFCS leading to stable milk supply along supply chain

Meet the innovators

The SPE model was initiated as a pilot in 2010 with the support of SNV's core subsidy funded dairy program. Interested youths received short-term practical training on technical aspects of silage making and some areas of dairy cow management.

The pilot started with four SPEs located in Nyandarua, Nyeri and Embu Counties. These four SPEs later formed a limited company – SPEN (Service Provider Enterprise Networks) Ltd. Since 2012, the SPE model has been scaled up through SNV's Kenya Market-led Dairy Program (KMDP) Phases I and II. This has resulted in formation of 29 SPEs spread across six Counties: 21 in Meru, 3 in Nyandarua; 2 in Baringo and 1 each in Nyeri; Nakuru and Uasin Gishu.

"When the experts prepare silage it comes out well. With the experts, you get quality silage for high milk production. I have experienced a huge improvement in milk production since I started using silage from the experts "
– Justus Mutuma, Farmer

Paul Mambo, a dairy expert from SNV explains that they found fodder availability as a major limitation to dairy production and decided to support the cooperatives. He is one of the team members from SNV who train youths on fodder production, silage making and farm management in general.

2.3.2 Realising the innovation

Initiating the innovation

In 2009, most parts of Kenya experienced prolonged drought as a result of near failure of two consecutive rainy seasons. During that time, SNV was working with Nyala DFCS particularly on interventions related to feed development and strengthening of local extension services. The drought had devastating effect on milk production, with milk collection at Nyala DFCS dropping by 90%. It was found that farmers were not preserving fodder on their farms in readiness for drought. This was the trigger for exploring the concept of a local extension support to the cooperatives, where at least 10 youth, who would be taken through skills development fodder preservation among other extension services. The trained youth were later supported by SNV to formalise and become a service provider to farmers offering mainly fodder related support for a fee. This was the genesis of the SPE youth-led agri-business model.

From idea to new service providing model

The SPE model is developed for the dairy sub-sector as a niche business to address the challenge of fodder access. As a business innovation SPE is based on the assumption of working with entrepreneurial farmers who are willing to pay for services that can enhance their farming enterprises. The selected DFCS are only a small part of dairy farmers groups that can be found in the high-potential dairy production regions in Kenya. There are over 13,927 active milk suppliers and over 30,411 registered members in DFCS that work with SPE groups. Within the selected DFCS and where

SPE have already been established, there are a total of 6025 active members and suppliers, but the SPEs have only managed to reach 949 (about 16%) farmers with silage making services (the most commercial service on offer). This points to the unexploited business potential for both existing groups and new groups. However, the challenge is for SPEs to gauge whether there is a consistent demand from this client base to sustain their business. It is also important to understand how these services affect the cost price of milk production (reducing the cost of production) for farmers to enhance their competitiveness and profitability.

Social and organisational challenges

- Slow adoption of farmers to new/modern practices (tillage, growing fodder, zero-grazing units)
- Labour peaks - Too high workload within same season
- Transport - having to travel long distances by public transport

Hurdles and successes

- Poor polythene quality (tube/surface) for silage making
- Machinery (limited access, breakages, poor quality) for silage making and hay baling
- Seeds fodder (poor quality &/or access)
- Small pieces of land for construction of proper zero-grazing units
- Farmers not following advice given, i.e. farmers uncovering silage before it is ready
- Rains lower the quality of silage harvested in that period
- Skill gap (e.g on animal health services)
- Rodents attack (moles)
- Drought - hence fewer silage making job opportunities (Seasonality of the business)

2.3.3 Scaling the innovation

Applicability of the innovation and next users

- Huge client-base for SPE in terms of DFCS members is an opportunity for scaling the model. This requires support at different levels. The link with strong cooperatives is a driver for scaling the innovation. To complement their service with other services makes it more profitable and viable.
- The link between cooperatives and youth can boost youth employment in the agricultural sector and shift the sector towards higher productivity.
- Shift toward sustainable intensification of dairy puts access to quality fodder at centre of sector development. SPEs can contribute to lowering cost of production
- Investment need in quality equipment and other inputs for both SPE and farmers can limit expansion of SPE businesses, though investment is only Ksh 60,000 for a chopper or pulverizer (divided by 3-6 persons)
- Seasonality of business and varying farmer adoption of services limits growth, which contributes to drop-out from groups.

Drivers for scaling

With a focus on silage making, the demand for SPEs have been limited to harvest seasons. The dominance of rain-fed systems makes this worse, leaving many SPEs without work and income during long periods of the year. The youth have increasingly engaged themselves in other farm related income generating activities over the last years, which makes them secure some income outside the harvest period. As a precondition for upscaling, it would be advisable for SPEs to train on and invest in other services besides silage making that will extend over the year.

Expected impact

Positive side-effects on wider environment

- ✓ Reducing unemployment and rural-urban migration of youths, especially those with limited educational background.
- ✓ Assuring a continuity of farms which would otherwise close down due to limited manpower

2.4 Practical Dairy Training Farms - Uganda



A new on farm training service for dairy farmers based on pay-for, and demand-driven training.

Training and knowledge of farmers is essential to support the sustainable development of dairy farming in (East) Africa. Most extension systems use the conventional approach characterised by handouts, free extension services and allowances for participating in trainings. The Practical Dairy Training Farming model in Uganda offers a new on-farm training service to farmers, based on pay-for and demand-driven.

Facts & Figures

Number PDTFs:	3
Total investment PDTFs:	200,000,000 UGX (USD 55,000) (60% subsidised)
Gross revenue PDTFs (year 1):	176,400,000 UGX (USD 48,000)
Number of farmers trained:	504 (since June 2016)
Course fee per farmer:	350,000 UGX (USD 95) (50% subsidised for women and youth by TIDE project)

This chapter is developed based on input from SNV Uganda

2.4.1 Description of the innovation

The Challenge

Uganda like many developing countries is still grappling with extension service delivery. Various extension delivery approaches have failed to increase the uptake and adoption of good farming practices that improve production and productivity. With a rapidly expanding population, environmental degradation coupled with limited resources (land and money), rethinking the way knowledge and technology is delivered to farmers has become a necessity. One of the approaches to improve productivity at farm level is the Practical Dairy Training Farming (PDTF) approach. Through this approach, model dairy farms (at different levels and in different locations) are identified and supported to develop into model training centres that can offer short practical courses to dairy farmers. While conventional development approaches have been characterised by handouts, with farmers predominantly accessing free extension services and getting allowances for participating in the trainings, the Practical Dairy Training Farming model is private sector led and demand driven.

How it works

Currently, three PDTF target six districts in Western Uganda. Farmers identify their individual needs based on their specific production challenges and pay for a training to bridge the identified knowledge/skills gap. The trainings are carried out at the practical dairy training farm and provide participating farmers the opportunity to practice their learnings and skills while at the farm. Participating farmers have the liberty to select the dairy training farm of their choice based on considerations such as the geographical location (which training farm is closest to them) or specific skills sets that the individual training farms are known for. Currently the trainings are based on three thematic areas: Feeds and Nutrition, Breeding and genetic gain, Animal health and Disease control.

If a farmer wants to focus on increasing milk output during the dry season for instance, he attends a training focused on this aspect under the theme of 'fodder, feeds and nutrition'. During the training he/she is introduced to relevant on-farm investments, i.e. the calf pen (including bucket feeding), paddocking, water infrastructure and silage pits and linked to service providers that can provide the required services.

The PDTF approach is based on the following principles:

- The courses are not curriculum based, but issue-based (i.e. address specific constraints in the production cycle), as identified by the project and as experienced by the farmers.
- Farmers can select the trainings that are most relevant for their situation, but they can also attend more than one training at different PDTFs.
- The training is not an end in itself, but aims to assist the trainee farmer to practice on their own farms the issues being taught. The trainings incorporate follow up of the trainees at their individual farms to facilitate uptake and perfection of skills learnt at the dairy training farms.

Users

This innovation is of interest for small, medium and large scale dairy farms from all over the 6 districts, as the course is full-time and includes accommodation. PDTFs are also of benefit for governments and NGOs wanting to promote specific farming practice or testing new innovations.

Investments & benefits of the innovation

Investments	Direct benefits
✓ Investment by PDTF: training facilities, accommodation, promotion	✓ Viable dairy training farms
✓ Investment by farmers: fee for training	✓ Demand-based training for dairy farmers
✓ Behavioural change: Willing to pay-for training, travel to training	✓ Increased investments in improving their farm by dairy farmers after following a training
	✓ Because farmers are paying, the likelihood of them applying what they learnt is much higher

2.4.2 Realising the innovation

Initiating the innovation

In June 2016, SNV Uganda and the Dairy Development Authority (DDA) launched the first ever Practical Dairy Training Farms (PDTFs) in South Western Uganda. The initiative is part of a four-year dairy project: The Inclusive Dairy Enterprise (TIDE) project that SNV is implementing in the districts of Bushenyi, Isingiro, Kiruhura, Mbarara, Ntungamo, and Sheema in South Western Uganda with funding from the Embassy of the Kingdom of the Netherlands (EKN) in Uganda. Through the project, SNV and its partners aim to improve dairy farm incomes for 20,000 farmers by increasing productivity (milk yield per cow). One of the components of the project is training, which is implemented through the PDTF approach.

From idea to a new business model for training

In 2016, three farms² were selected by the TIDE project, based on their performance in the 'best farmer' competition (a partnership between New Vision and the Embassy of the Kingdom of The Netherlands in Uganda) and their subsequent interest in the concept during the TIDE project formulation.

The initial idea was to offer one-week residential training courses. The number of days was later reduced to four days because of the challenge in keeping farmers away from their farms for long. Each farmer pays 350,000 UGX (81 Euro) to participate in the four day training course at any of the three practical dairy training farms, which fee covers accommodation, meals, training and movement to and from the PDTF to the reserved places of abode.

The training materials used by the PDTFs are developed by the TIDE project, with support from the National Agricultural Research Organisation (NARO) and input from other dairy experts (including DDA). The trainers are trained, supervised and coached regularly by the project team staff with support from other partners (e.g. Agriterra, The Friesian). For the training farms, providing the training is a business opportunity. In addition to running the regular four day trainings (once a month for 15-30 farmers) for the targeted farmers, the training centres are also evolving, offering additional trainings, e.g. training livestock service providers (Artificial Insemination services, tick control, etc) and training institutions like Makerere University, Mountains of the Moon, Mbarara University of Science and Technology) or NGOs.

Marketing is done through various channels, including targeted campaigns, media messages and through cooperatives and organised farmer groups. Since the training started in the period June 2016 – October 2017, 504 rural farmers have undergone training at the PDTFs earning the three PDTFs gross revenue of 176,400,000 UGX (41,000 Euros) in a span of one year.

To get the PDTFs up and running has required an investment of approximately 200 million UGX (45,500 Euro) per PDTF, 60% of which was covered by SNV and the difference (40%) by the respective PDTFs. This was largely used to construct basic training facilities (classroom, dining, accommodation) in the three PDTFs, as well as additional investments

Return on investment of PDTFs

The Rubyerwa Dairy Investments of Mrs. Philomena Kemijumbi Nshangano is one of the farms selected to be turned into a PDTF. To prepare her farm to become a training centre she invested 80,000,000 UGX (18,600 Euro) towards finishing the farm facilities, furniture, purchase of kitchen utensils and an equal amount to increase milk production. 60% of the training centre investments were met by the TIDE project.

In the last one year her farm has trained 144 dairy farmers earning the farm gross revenue of 50,400,000 UGX (11,700 Euro) from the training alone. Philomena has innovated alternative sources of income; marketing of record keeping books on daily milk production, daily financial expenditure, income inflows, calving, cattle health and treatment records and artificial insemination and breeding which are sold to trainee farmers. In the same period, the farm has increased its income by diversifying into a number of enterprises including; milk sales (Milk production has increased from 450 to 650 litres per day delivered to the local dairy cooperative), cullings, breeding bulls, farm visits, farm record books, bananas, timber, and goats. The current return on investment is 150% (if additional milk production is taken into consideration).

² AGDI Dairy Farm and MUTANOGA Farm in Kiruhura district and Rubyerwa Dairy Investments in Mbarara district

on the farms. Farmers on their part pay a training fee of 350,000 UGX (81 Euro) to attend the training, which fee covers all the training costs (mainly accommodation and upkeep). After one year, 63% of the investment costs were earned back (see text box).

Social and organisational challenges

In introducing the PDTF approach, the SNV TIDE project was introducing two novel concepts: Farmers paying to attend training; and farmers being trained on an actual farm with practice-based methodologies. Besides the investment costs to turn a farm into a practical dairy training farm, the change in mindset of farmers from traditional farming practices to farming as a business was one of the biggest challenges to the success of the PDTF. Individual farmers identify their needs based on their specific production challenges, pay for the training to bridge the identified knowledge/skills gap, and travel to the training location and leave their farm for a few days. After the training, the gained knowledge requires change in dairy management in order to transform their dairy farming into a business. Some of the farmers that attended one training farm, have enrolled to the next and few have attended all the three to benefit from a total package.

Expectations on the side of the PDTFs. The PDTFs invested over 80 million UGX each on their farms with the expectation that the return on their investment would be immediate and high (training an average of 30 farmers each per month). This expectation has not been met, however the numbers of farmers attending the trainings are consistent with an average of 15-20 farmers attending training per PDTF which is encouraging.

Hurdles and successes

One of the challenges as well as the success of the PDTF formula is the pay-for training. George Oroma, SNV Dairy Advisor, believes this fee for service will yield more results and adoption of skills than free extension services that have been offered to farmers in the past: *"Anytime a farmer has to pay for a service using his/her hard earned money, the farmer is able to make informed decisions that optimise the return on his/her investment right from the selection of who is best suited to attend the training to the skills gaps that justify the training. Because of the investment that the farmers make to acquire this knowledge, their motivation to learn and implement the learnings in their farms is also high."*

The biggest change brought about by the PDTFs is the change in mindset of the farmers, many of whom have been carrying out dairy farming as a tradition and for prestige. Over the last few years the weather patterns in Uganda have become increasingly unpredictable with prolonged droughts that have led to loss of cattle. The trainings have thus come at an opportune time when farmers are increasingly becoming aware of the need to change their farming practices and embrace farming as a business. One of the significant changes witnessed is the volume of on-farm investment by dairy farmers. By August 2017, farmers had invested a total of € 150,000 into their farms after attending the PDTF trainings³.

Gradually a change of attitude is being witnessed among dairy farmers who are slowly realising that the traditional farming practices cannot sustain them and they need to adopt dairy farming as a business to earn income and manage the effects of climate change.

Proof of concept. In market development it is hard to set expectations because it's hard to know how the market will react vis a vis the set targets. In developing the PDTF approach, SNV set for itself targets based on untested expectations. While the high targets are not being met, the fact that the three PDTFs are still in business after more than one year and are consistently providing training to farmers on a monthly basis is testimony that the concept has acquired a place in the market. Farmers are paying 350,000 UGX to attend trainings where no such notion existed before.

³ Most of the on farm investment has gone towards; Paddocking of dairy farms as a pasture management solution; Construction of silage and hay bunkers to deal with the shortage of food due to unpredictable weather patterns; Investment in water for production – rain water harvesting and in dam liners for already existing dams and construction of dams for farms with non- existent dams; Construction of milking parlours; Construction of biogas digesters; Construction of spray race

Meet the innovators

Rubyerwa Dairy Investments is a medium sized farm in Rwanyamahembe, Sub County in Mbarara, one of the SNV target districts. The farm sits on 80 hectares and draws its name from its three farms - Rubingo, Byembogo and Rwanyamahembe (RUBYERWA) that keep different stages of herd structure. This is where Philomena Kemijumbi Nshangano, the Executive Director and Founder of Rubyerwa resides. Philomena, a former Permanent Secretary in the Ministry of Public Service established the farm 40 years ago with her late husband. "I married into a cattle keeping family where the main source of income was from selling milk and dairy cows. My late husband and I started planning for our retirement as early as 1972. What came to our mind was acquisition of land for farming in the countryside. Farming to us would help supplement the income we received as public servants. Our goal was to breed and sell livestock," Philomena recalls.

Philomena and her husband invested in their first stock of 30 in-calf heifers in 1977. By 1979, many had died due to poor management since they were managing the farm remotely. Not to be deterred, Philomena and her husband in 1982 once again bought 30 in-calf cows and this time they survived. This is the stock that they have been improving on to-date. In 1989 Philomena lost her husband and became a widow at 45 years of age with six children, the youngest being only 10. Philomena however was determined to keep her husband's legacy alive and grow their dairy farm into a thriving commercial dairy farm. In 1990 they started using artificial insemination with semen from government through a technology of synchronisation. With the AI technology came a number of necessary changes; they had to manage their records to be able to trace the genetics of all the animals for their breeding programme to work. They also needed to keep good records of milk sales as this gave a good history of the

"It is through record keeping that we have been able to produce proven quality breeds of cattle that we now proudly market locally and in the region as the best milkers"

– Philomena Kemijumbi Nshangano

different cows in her farm. "It is through record keeping that we have been able to produce proven quality breeds of cattle that we now proudly market locally and in the region as the best milkers. This has strengthened our brand within the region and won us recognition and several awards from various fora," Philomena adds. (Some of her awards include: Celebrated woman dairy farmer 2012 by Uganda Crane Creameries Cooperative; 2013 African woman farmer award in Cape Town; Platinum winner 2014 and 2016 in the medium category in the national dairy quality awards by Dairy Development Authority; Model Farmer Excellence Awards for the best dairy cow of the year 2015 & 2016.)

In 2014 DDA awarded Rubyerwa a milk cooler (1,000 ltr) with generator after winning the platinum award for being the best medium-sized dairy farm. Rubyerwa farm cattle feed under a rotational grazing system and are supplemented with silage, green chopped fodder from their 10 acreage of Napier grass (and what is purchased from out-growers) mixed with brewers' waste. The ambition of the farm is to increase supplementary feeding, distribute enough clean water and optimise breed quality for marketing of heifers and bulls. The farm is now regarded as a model farm with various institutions of government and private sector visiting and carrying out benchmarking visits to the farm and students signing up for apprenticeship and coaching. Philomena's vision is to mentor farmers to take up dairy farming as a business from which they can earn income.

John Tuhamize, a dairy farmer in Mbarara district invested 6.5 million Uganda Shillings (1,700 Euros) towards the construction of a milking parlor after attending one of the PDTF trainings. "Times have changed. We cannot continue milking our cows in the bush. Milk production has become very commercialised and milk traders are demanding quality milk and more milk. With this milking parlor I will not only be able to start milking early unlike now when I have to wait for daylight, I will also be able to supplement the feeding for my cows as I milk them which will give me more milk."

Meet the innovators

Bells Katongole is a dairy farmer and Chairman of Abesigana Kashari Dairy Cooperative in Mbarara district. For most of his adult life he was a 'telephone' farmer, working in Kampala as a public servant and managing his farm by phone. Because he was largely absent from his farm, he faced a lot of challenges in his farm business. 'Our focus was on breeding improved breeds through Artificial Insemination (AI) but it was not effective. We had a lot of repeats and most of the calves died. Two years ago I retired and decided to focus on my farm but it was not easy, I still struggled with finding feeds for my cattle to be able to maintain the quality that I wanted. I got to know about the SNV dairy project and decided to attend one of their practical dairy trainings. Through the training I learnt how to grow pastures for our cattle and make silage and hay. I also learnt about the importance of having a milking parlour. The training made sense, the owners of the practical dairy training farms where I attended the training were successful. I returned inspired and encouraged to carry out farming as a business.'

"For the first time in my life as a farmer I was able to feed my cattle throughout the year, even during the severe drought."

The first thing Bells did upon his return was to call up his son who is a teacher by profession and request him to come and support him at the farm. 'Most of our children have grown up seeing us struggle with farming and many have opted to pursue careers in other professions other than farming because farming has never been very lucrative.' Having now seen other successful dairy farmers however, Bells knew that he could achieve the same. He decided to build a milking parlour that could accommodate 14 cows with support from SNV. To encourage the cows to come and be milked in the milking parlour Bells was advised at the PDTF to supplement their feeding during milking time. This soon became a normal practice at Bells farm. We would give the cows hay and silage as well as minerals and our milk increased significantly!

'At the PDTF we also learnt how to grow our own pastures and the importance of paddocking as a pasture management practice which lessons I implemented in my farm.' In 2016 Bells harvested 450 bales of hay and 300kgs of pasture seed which he sold to members of the cooperative to encourage them to grow their own pastures. 'For the first time in my life as a farmer I was able to feed my cattle throughout the year, even during the severe drought. As a result of this we did not experience a significant reduction in our milk. Where before we used to get 100 litres of milk in the rainy season and 50 litres in the dry season, now our average is 250 litres in the rainy season and 150 in the dry season from our 35 milkers.'

Slow uptake of the technologies on farm. Gaps still exist between learning and practical implementation on farm because of limited resources. SNV is investing in training and coaching the youth to provide extension services using improved technologies to farmers as a business. So far the project has trained 6 youth groups who have so far invested 21 Million UGX (4,900 Euro) in silage making equipment.

False expectations on the side of farmers. Farmers who attended training got disillusioned because they expected that everything would be rosy once they finished the training, then the dry season came with significant challenges, especially with cattle dying due to lack of water and pastures. However the unpredictable weather patterns has shown farmers the importance of adopting better farming practices and technologies like silage and hay making, water harvesting, investing in improved breeds to boost production and manage the effects of climate change.

2.4.3 Scalability of the approach

The PDTF model is applicable for dairy farming systems in the (East) African region. Though the PDTF was already successfully practiced in Kenya, the concept was new to Uganda, offering a place to farmers for practical training in the vicinity of his/her own farm without having to leave the country (or the region). More PDTFs in other dairy regions in Uganda and (east) Africa can boost the quality of training and subsequently enhance productivity and sustainability of dairy farming in Africa.

Although the number of trainees in the project was below the initial project target of 100 per month or 5000 farmers in 4 years, the model is viable and the potential for scalability is feasible. Providing training is a business opportunity. The PDTFs can start offering additional trainings to e.g. livestock

service providers (AI services, tick control, etc.) and training institutions like Makerere University, Mountains of the Moon, Mbarara University of Science and Technology; and NGOs.

For the PDTFs to be sustainable and ably scale their business, the PDTFs have to operate as business incubation centres for the youth and farmers going beyond simply carrying out training of the a few dairy farmers. One of the opportunities is for the PDTFs to partner with institutions of learning to pilot new research of innovations that are being developed at research and development institutes. For instance MbaZardi and Makerere University are partnering with AGDI PDTF to pilot their seed multiplication technology for scalability.

The question of quality control to ensure that the standards and quality of training in the PDTFs remains up to par once SNV is out of the picture needs to be looked into to ensure that the PDTFs remain relevant and offering quality training to farmers. Aspects of Quality Control at the PDTFs and capacity building of ToTs is paramount. Currently continuous evaluation of trainers by trainees is being done every time there is training. Training materials and practical demonstrations are also continuously being updated; and staff and participants' welfare reviewed regularly

Drivers for scaling

Targeting cooperatives rather than individual farmers can increase the number of trainees. The cooperatives for instance can pay for their farmers to come and attend the trainings and recover the money through a check off system with their milk. This approach is already being piloted in 2 cooperatives (Nyakahita and Rwembogo Cooperatives) who have already sent a total of 40 members (including their spouses and children) for the training.

The project is targeting youth and women in a bid to encourage more youth to take up farming as a business which previously has been left largely to the elderly. During the course of implementation it was realised that the older dairy farmers were slow in adopting new technology and resource constrained to implement what they were learning from the PDTFs. Incentivising youth and women i.e. through subsidies can promote the uptake and impact of the PDTF.

The enrolment of women into the training is impressive and attractive at the same time. The background of women in dairy farming households is evidently clear that they are knowledgeable and much engaged than their husbands right from grazing to marketing of milk but they don't participate in decision making after the money has been earned. Over 71 women farmers have been trained in a period of 12 months. "The fraction really calls for major efforts" says Tayebwa. Women, after training, leave with a lot of enthusiasm and responsive to the interventions to become part of the transformation but most of them have challenges. Men still hold a lot of power on decision making. Those who trained and appeared enthusiastic, have been constrained by the resources to begin implementing the good practices. Those who have funds and authority are seen to be putting into practice the skills they acquired with a desire to start adding value to milk to get more income. Those who don't have the means are devastated, struggling with little or no progress at all. Family issues play a big role. "I visited 11 women after training, 4 of these are on the right track on fodder cultivation and feed supplements, 3 are struggling, while 4 totally appeared to be stack or not serious. They faced challenges of; lack of commitment from husband and other family members, lack of skill in fodder and pasture preservation techniques, lack of enough capital, and high labour turnover" says Dr Musasira, a trainer.

The private sector is currently the key player in the development of Uganda's dairy industry. It is responsible for development infrastructure for milk transport, bulking and processing; marketing and market promotion; supply of inputs; as well as provision of advisory and business development services particularly animal health, breeding, farmer training and financial services. Government largely plays a facilitating role, creating an enabling/ conducive environment for private sector participants in terms of; freedom to expand on investments by provision of market, right to expression, security, infrastructure like reliable electricity, water, good roads and subsidised mechanization equipment. Government realises that wealth comes from the private sector and promotes its growth. One of the major challenges to Uganda's dairy industry is the dominant traditional, smallholder production system and informal market. Dairy has a potential to play a greater

role in the economy, particularly in providing regular income and employment opportunities for resource poor households. There is a huge potential to increase dairy production and productivity if adequate attention is paid to promoting access to markets as well as to good dairy breeding stock, improved dairy technologies and efficient advisory and business development services particularly animal health, breeding, finance, markets and marketing infrastructure.¹

Expected impact

The change in weather patterns over the years however has also created a gap for alternative solutions to manage the unpredictable and often devastating effects of climate change. The PDTFs offer practical demonstrations on how to start farming as a business with the cost and benefit analysis for the investment so that farmers can make informed decisions. For the farmers who have attended the trainings, many have been convinced that they can make money and have embraced the on-farm investments and the subsidies that the project offers on specific products like construction of milking parlors, water for production etc.

2.5 Milk Vending machines - Kenya



Innovative distribution of affordable, high-quality processed milk for immediate consumption.

Kenya has a high milk consumption of 127 kg milk equivalents per capita. Most of the milk reaches consumers via informal chains in fresh raw form which is not chilled. Despite this, there is an increasing demand for processed high quality milk. Milk vending machines ('Milk ATMs') respond to this need by shortening the dairy value chain and providing processed milk at lower costs.

Facts & Figures

- ✓ Investment costs ATM: KES 350, 000.
- ✓ Costs of 1 litre of milk: KES 55-60 (compared to processed milk sold at KES 120 for the same volume)
- ✓ Cost per license to operate a milk ATM: KES 10, 000
- ✓ Average daily milk sales per ATM in Nairobi: 200 – 500 litres
- ✓ Average gross profit per liter of milk sold using ATM: KES 15
- ✓ There are an estimated total of 265 milk ATMs in Kenya with 62% of them in Nairobi (KDB 2017)
- ✓ Most suitable in (peri-) urban areas

2.5.1 Describing the innovation

How it works

The milk vending machine operates just like the bank automated bank teller machines. At the sell point, the consumer inserts a coin into the machine, indicates the quantity they want to purchase and collects the milk using a container, which is brought by the customer or provided by the vender (at an extra charge).

Some supermarkets have adopted another type of milk ATMs where the buyer does not insert coins to the machine, but the machine generates a payment voucher which is stuck to the milk container and payment is done at the cashier.

First introduced in Eldoret town in 2013, milk ATMs are now common in many supermarkets and traders across major (peri-) urban towns including Nairobi, Nakuru and Kisumu. The innovation is considered a best alternative for milk traders to comply with health regulations following the ban on the sale of raw milk by the Kenyan Dairy Board (KDB).

The machines can provide a shorter dairy value chain as milk from the farmers can immediately be pasteurised and sold in the dispenser. It provides farmers with an alternative milk outlet to better bargain for milk price. And leaves out the middlemen, which reduces the price for the consumer and increases the profit of the farmer

Users

Milk ATMs are increasingly being used in Kenya and are now located in almost every business centre in Nairobi. They are usually located in accessible urban and residential areas, giving the chance for families to source their milk for breakfast and dinner, but also for workers to get milk during the day.

2.5.2 Realising the innovation

From idea to a new milk dispenser

For Mr Kiplimo Boit of Pure Products Kenya and a director of Tarakwo Cooperative, the idea to own Milk ATM was hatched when they made a visit to the Netherlands where they learnt about Milk ATM. On returning home, they sold the idea to their family members and stakeholders.

Mr Boit proceeded to save enough money with which he ordered the first machine from Italy with a capacity of 1500litres in 2013. His motive was to meet the growing need in Eldoret town for supply of good quality milk that consumers can buy at any time. He chose to locate the Milk ATM in Eldoret town where he converted a room in a building he owns into a milk ATM shop. His milk supply was from his own farm of about 200 acres with 100 milking cows, which supplies him with adequate milk for the Milk ATM. As the business thrived, he went for a second and third Milk ATM, which he located next to the first one.

Mr Boit consulted with Kenya Dairy Board (KDB), the dairy industry regulator on milk business regulations in the country. He learnt from KDB that he needed several permits and licenses to operate milk business. The KDB license is certifying after inspection on the premises, equipment, workers' health certificate and protective clothing. Next is the county government which issues business permit.

Since Boit gets his milk supply from his farm which is 25 Km away from Eldoret town, he had to obtain

One director of a small cooperative in Eldoret also got the idea of operating Milk ATM business after visiting the Netherlands. On return, he discussed the idea with the members of the cooperative who bought the idea. This cooperative initially only bulked and chilled raw milk from members then sold to nKCC and Daima. With the knowledge about Milk ATM, they saw an opportunity to value add to their own milk by pasteurizing and selling at a higher price than they were getting for raw milk. The directors implemented the idea by sourcing capital from the shareholders and some funds from the East Africa Dairy Development (EADD) for training and consultancy services. EADD empowered them with knowledge and skills through a series of trainings on milk production, marketing, feeding and feed management and breeding as well as machine acquisition and how to establish the business. The cooperative obtained all the necessary licenses and permits to operate Milk ATM business and also sought assistance of Ministry of Livestock for animal health care in case of disease outbreaks. From Milk ATM business, the cooperative expanded business portfolios to include agro vet where they offer check off services to members for services and products consumed.

Some supermarkets that have taken Milk ATM business got the business concept from machine distributors. This is the cases for Naivas, Khetia and Waiyaki Way Supermarkets, which after listening

to a pitch from some of the machine distributors saw Milk ATM as an opportunity to become more competitive in the changing market and to respond to a ban to use polythene bags in the country. In their own word, 'we decided to adopt the milk ATMs after the ban of polythene bags by the government because we wanted to retain our customers and give them another option to packaging so we sell empty plastic bottles' (ATM attendant, Waiyaki Way Supermarket).

Kenya Dairy Board, the regulator of the dairy industry, promotes the Milk ATM innovation as safe quality milk source and business for the cooperatives and farmers. The first ATM was licensed in 2009 and currently the number of licensed ATMs stands at 850 though the actual number of operating dispensers is higher. Operating Milk ATM cushions these entrepreneurs from middlemen manipulations and places them in a position of stronger bargaining power over price. 'It is a liberalised market now, so if one is ready to put up the investment even if it is a farmer, if he meets the basic requirements we allow, says a KDB official in Eldoret. The official goes further to explain that some of the groups now operating Milk ATM in Eldoret town were former hawkers, who have joined together and now are dispensing pasteurised milk (Mr. Limo, KDB, Eldoret).

Hurdles and successes

- Marked seasonal demand and supply, worse in December when demand peaks but milk supply sharply drops
- Drop in on the spot milk sales during the rainy and cold season
- Competition from other upcoming ATMs in the market
- Electricity interruptions disrupt the day business operations
- Milk spoilage due to electricity interruptions and lack of water for cleaning
- Lack of water especially when there is water shortage from the county supply
- Milk price fluctuation
- Competition from hawkers
- Delay in milk delivery especially during the rainy season due to impassable roads
- High import tax and operation/running cost
- Abrupt machine hanging
- Long queues during peak hours at 7am, 1pm and 6pm
- High initial capital required to purchase equipment
- Key pad type requires an attendant to operate
- Milk ATMs are not classified as dairy equipment by the Kenya Revenue Authority, and hence attract high import tax.
- Ensure milk quality regulations: Cleaning of the machine may pose milk quality and safety issues because it is unknown how hygiene of the equipment is maintained by the vendors, yet quality inspections may not be regular and trust in the trade be questioned
- ATMs need power to function and cooling will be interrupted during blackouts, reducing the milk quality.

2.5.3 Scaling the innovation

Applicability of the innovation and next users

Milk ATM has potential for use in institutions and in the growing **peri-urban centres** where a concentration of consumers reside or frequent and will find applicability as well in regions with a high-density of milk producers like in Rwanda under the "One Cow Programme". Use of Milk ATM may be adapted to dispensing fermented milk products as well and cooking oils.

The innovation could be attractive to youths in agribusiness ventures. Large scale farms and eating places along the highway where vehicles have regular stopovers are next potential locations for Milk ATM business within the East African Community.

Drivers for scaling

A change in taxation policy that classifies Milk ATM under dairy equipment will lower the import tax presently charged on the machines in Kenya. The Kenya Dairy Board and the county governments as well could review licensing fees and trade policies to reduce the number of licences and permits required and the amount charged to reduce overheads for the entrepreneurs. Another area in regulations to explore is development of relevant standards for the machine and redefining the standards to cater for Milk ATM operations in the Kenya market conditions.

Power is taking substantial proportion of overheads in the Milk ATM business. This calls for technical advances to find alternative power sources from renewable energy to simulate the innovation further.

Kenya has a number of champions to catalyse scaling of the innovation, such as cooperatives, Supermarkets and farmers, who are in this business.

Financial institutions to give loans to youth as start-up capital

Considerations for improvement

- Have a swipe card type of ATM
- Provision to allow for mobile payments through Airtel money, Mpesa
- To allow accumulation of credits points just like in supermarkets where one can redeem the points to gain customer loyalty
- Provision to allow dispensing of hot milk especially during the cold season
- Expand the dosing panel to accommodate 20litre Jericans to reduce milk handling

Expected impact

- Employment (ATM attendants, drivers)
- Reduced littering from milk packaging materials as consumers receives milk in their own containers, recyclable or in bottles.
- Provision of good quality milk as it eliminates risk of dilution or contamination of the milk since the customer gets the product himself.
- Provision of affordable milk to all consumers of different income ability
- Youth involvement in dairy. About 50% are operated and owned by the below 30 bracket.
- Has provided business for cooperatives and large scale farmers where it has reduced exploitation by middlemen
- Promotion of milk consumption hence improved nutrition
- Improved hygiene in milk handling
- Promotion of sale of dairy equipment such as milk holding tanks, pasteurizers, chillers

3 Discussion: supporting innovations to boost East African dairy sector

The former chapter described five innovations in the dairy sector that have been developed in the past years in Eastern Africa that support development of the dairy sector. Though different by nature, country, position in the dairy value chain and in its phase of development, they all form inspiring stories on how individuals or organisations saw opportunities for improvement and have been working on realising these improvements in practice, overcoming the hurdles and challenges that go along with these processes.

For development of the dairy sector in Eastern Africa, there is general consensus to focus on productivity increase rather than increasing herd only. In most East and South African countries, the cost of production is high, mainly due to high costs for feed and fodder (i.e. in Zimbabwe, feed accounts for 80% of the cost of production). Increasing the productivity per cow (more output with the same or less input) is a fruitful way of sustainable intensification of the sector, which can not only improve production but also food security, environmental pressure and economic benefits for the farmer. Increasing the productivity per cow relates to breeds, availability of good quality and quantity feed, water intake, improving health status and farm management. This is supported by good extension service and advice, and a well-functioning value chain in which commercialisation of the dairy value chain is possible.

The innovations discussed in this chapter are efforts by individuals or organisation to do something new in the value chain that is contributing to increasing productivity. The question now is if we see common aspects in these innovations in terms of what was needed to realise the innovation or what will be needed to scale up and scale out the innovation. For analysing these differences and commonalities, we have used the elements distracted from different studies described in chapter 2.3, to consider what is needed to further develop these innovations and make the scaling of these innovation a success. Please find an overview in the table 3 on the next page.

Important factors to support scaling of innovations.

If we look at the factors in table 3, we notice a few common aspects that are important to take into account when aiming to bring innovations to scale.

(Public sector) governance

For most initiatives to be successful, a **liberalised market** would be helpful to allow for new products or services to enter the market. In the Ethiopian case for private advisory service, it is hard to establish a new service if a (free) public service is available as well. However, in this case, the private service is considered to be of higher quality which is also accessible in some remote areas where public services do not reach and should pay off for farmers to invest in. High quality and reliability of services is a key USP for such a service to be successful. In the case of the milk vending machines, poor copies of the original machines are witnessed, made of bad material such as heavy metals which are a potential risk for public health. The government or sector associations can facilitate by setting a (sector) standard for quality of goods and services provided to support the dairy sector. They can also advice or organise certain trainings for various actors in order to enhance the development of high quality services. In these specific innovations standards on fodder/silage quality, expertise required for advisory services, minimum infrastructure required for a training centre and milk quality protocols to be respected by ATMs are some of the standards which could be set and enforced by the public sector. In an already liberalised market, such standards would be helpful to prevent proliferation of poor quality goods and services, and to distinguish high quality services that actually benefit productivity and sustainability of the sector. Hence, in addition to a liberalised market, a certain form of control by public actors or the sector would be necessary.

Table 3: Factors of importance when seeking to scale the innovations

	(Public sector) governance	Knowledge /education/ awareness	Technology	Business model	Finance	Value chain development
Mobile ICT Tools	Creating an enabling environment: good internet, liberalised market	Available expertise (ICT, dairy chain, farm management, integrate record keeping) for farmers and advisors	Good internet, mobile devices (phones, tablets, etc.). reliable electricity	Farmers pay for the new services which should lead to increased productivity. This requires a short ROI especially for smallholders	Seed money for tool development (from entrepreneur, cooperatives, NGOs, government, etc.) Credit access options (low interests, etc.), Own (private) investments	Mastery of value chain, Connect value chain actors
Private Advisory Services	Liberalised market enhances initiation of private advice Set of quality standards for advice enhances trust	Expertise of advisors in dairy production; farm management; value chain; economics. Experience with hands-on advisory skills High quality training	Tools to monitor progress of advice Machinery for specific services (hoof trimming)	Farmers pay for services that increase their productivity. Requires short ROI for farmer. For advisor, ROT is longer. Each advisory service should have a USP (eg. feed, hoof trimming etc.) to serve as an entry point	Funding for training of advisors. Funds to hire advisor. Credit access options (low interests, etc.),	Mastery of value chain, Connect value chain actors → create a hub
Service Providing Enterprise	Liberalised market Set quality standard for services delivered	Farm management, value chain, economics, hands-on experience, advisory skills, high quality training	Machinery for specific services (chopper, compactor, bailing); Tools to monitor progress of advice	Each advisory service should have a USP (eg. feed, hoof trimming etc.) to serve as an entry point, short term ROI for farmers and long term ROI from advisers	Seed money for tool development (from cooperatives, NGOs, government, etc.) Credit access options (low interests, etc.), Own (private) investments	Mastery of value chain, Connect value chain actors → create a hub
PDTF	Liberalised market Set quality standard for training services	Farm management, value chain, economics, hands-on experience, advisory skills, high quality training, many specialised trainees, tailor-made trainings	Training facilities (centre, farm) Tools to monitor progress of advice, machinery for specific services	High investments costs from PDTF, high costs for farmers, advantage to farmer needs to be clear to enhance WTP, a large group of actors need to be engaged (farmers, universities, NGOs, etc.	Seed money for tool development (from cooperatives, NGOs, government, etc.) Credit access options (low interests, etc.), Own (private) investments	Mastery of value chain, Connect value chain actors → create a hub
Milk ATMs	Liberalised market, facilitate import of machine (e.g. tax exemptions), set quality standards, control milk quality	Milk quality training → pasteurisation, Technical skills for operating ATMs	Vending machines (assembling or importing)	High investment costs but short term ROI, more attractive in urban areas	Access to credits	Shorten the value chain → eliminate the middle men

Business model

Turning ideas into cash, is what distinguishes an invention from an innovation (see introduction). Commercialisation of ideas require a sound business model. In many (East) African countries, farmers do not yet consider **farming as a business**. Any changes that make farmers see dairy as a business would increase their desire to invest in dairy and to pay for services that improve on productivity.. The willingness of farmers to pay for new products or services is required for these innovations to be successful. This implies a pilot phase needs to provide a clear idea on the return on investment of a farmer to convince them on its adoption. For the smaller farmers, a **return on investment** should most probably be experienced on a short-term. This is because smallholder farmers are more likely to be attracted to investments whose benefits are immediately visible. For entrepreneurs (i.e. advisers aiming to set up their own businesses, or entrepreneurs aiming to sell a new product) a return on investment of their training or initial investments can be longer. This is because they often need some time to establish their businesses and to build trust with their clientele before they can start reaping good profits.

Technology

Technology requirements for these innovations to scale up differ. In some cases, access to good internet is required, but not for all. In the case of the milk ATM, an uninterrupted supply of energy is required. The technology is most often not the missing link in an innovation, soft- and orgware (skills, knowledge and enabling environment) elements can be more restricting. Mobile phone and internet connectivity is developing in rapid pace on the continent. Including services with ICT or data offer huge opportunities for development of the sector.

Finance

For a business model to succeed, finance is needed. Most innovations described in this publication were lucky to have had seed money to kick-start the development. Access to finance is important for them to be scaled up. In East Africa (and most other African regions), livestock farming is seen as a risky business by finance institutions and hence they get a limited access to loans.

If dairy chains are more inclusive and build good horizontal and vertical linkages, they will be more advantaged to secure financing. For example, banks will be more willing to provide loans to a cooperative than to an individual farmer. In the same way, input providers would more readily lease inputs to a cooperative than to a single farmer. innovations to be successful. However, we noticed, most initiators requested **own investments in addition to seed money**. This complements the idea of seeing dairying as a business.

Value chain development

To be successful, the innovation should take into account its place in the dairy value chain. For this aspect, we see a difference between the production and selling side of the value chain. If farmers do not have a regular market outlet providing a satisfactory milk price, they will be discouraged from making innovations that increase production. Similarly, if farmers do not have an incentive for selling high quality milk, they will not invest in innovations that improve on milk quality. Increasing milk production (quantity and quality) needs to consider integrative improvements that might be required along the dairy chain. To this regards, processor-facilitated dairy chains that support the players downstream are recommendable in the region.

Other aspects that have been important to success

Trust is customers is essential for an innovation to be successfully scaled. In the innovations presented in this publication, we have seen different ways to enhance trust of the customer. Tangible and quick results improve trust in service and increases WTP (for example in the private advisory service, and the SPE). Also to work with partners that have good reputation or long term relation with the target group. In the PDTF, the selected training farms in the pilot had a good reputation in the region. Likewise, lead farms can play a role in creating trust of farmers.

Including social aspects to the innovation increases social sustainability. Use of a specific target group, such as **youth or gender**, provide a strong identity to the innovation. It also enhances inclusive business models.

Recommendations

What does this learn us when aiming to support innovations in the dairy value chain? What should be taken into account for further development?

- Combine technical aspects, with social and organisational aspects
- Include elements of (public sector) governance.
- Ensure the innovation has a sound business model that supports farming as a business and has a clear return on investment for both the customer and the entrepreneur
- Support access to credits and require own investments of the entrepreneur in addition to seed money.
- Be part of or create a hub in the value chain (on the production side), e.g. linking to processors, cooperatives. Making mass supports the uptake of the innovation
- Create a mechanism to enhance trust with the customer, i.e. demonstration at a lead farm, add a service with quick and tangible results to enhance demand for other services.
- Involve youth and/or gender in the innovation to support social sustainability in the dairy value chain, and to enhance a next generation in the farming sector.

Further Reading

Kenya Market-led Development Project

The Kenya Market-led Dairy Programme (KMDP) aims to contribute to the development of a vibrant and competitive dairy sector with beneficiaries across the value chain. KMDP acknowledges and appreciates that the dairy industry in Kenya is private sector driven. The programme has two pillars or strategic levels of intervention: (1) dairy value chain (increasing efficiency, effectiveness & inclusiveness of the dairy value chain); (2) sector issues (promoting/supporting interventions and innovations that address systemic issues).

In the second phase of the programme the transition from aid-to-trade relations is facilitated as well as enhanced business linkages between Dutch and Kenyan companies active in the dairy sector. This is expected to contribute to a more sustainable model for dairy sector development as well as knowledge exchange, transfer of skills and technology, and cross border investments. To facilitate this, KMDP-II has an Innovation & Investment Fund that provides financial contributions to feasibility studies, demos, pilot projects and innovative business cases.

KMDP is a programme funded by the Embassy of the Kingdom of the Netherlands. The programme started on 1 July 2012, the second phase runs until 1 July 2019, and is implemented by SNV in collaboration with stakeholders in the dairy industry.

3R Kenya - Resilient, Robust and Reliable

As part of the transition strategy from aid to trade, Wageningen University & Research implements a project that assesses and validates to what extent lessons can be learned from the Netherlands Embassy's Agriculture and Food and Nutrition Security programmes. The 3R Kenya project investigates whether these lessons from the aid era can be transferred and scaled up in the coming trade era, and as such be better anchored within Kenya.

3R Kenya focuses on the aquaculture, dairy and horticulture sectors. These sectors are actively supported by the EKN in Nairobi. All three sectors have growth potential as well as contributing to food & nutrition security.

The overall aim of the 3R Kenya project is 'Well informed stakeholders actions support the transition from aid to trade and strengthening the aquaculture, dairy and horticulture sector'

DairyBISS - Dairy Business Information Service and Support project Ethiopia

DairyBISS is an EKN-funded project to stimulate private dairy sector development in Ethiopia, carried out by Wageningen UR Livestock Research and partners in Ethiopia and The Netherlands. Starting from 2015, this 3-year project will establish a dairy business platform that initiates and follows activities in business development, capacity building, and business information development. Proves of concept (PoC) will be initiated for technical and organizational innovations like private farm advice, innovative housing systems, and forage production. Results will inform both business practice and long term sustainability of the sector. These activities add value to existing dairy development initiatives like the Agricultural Growth Program and dairy-related projects.

The aim of this project is to increase the number of profitable dairy farms and firms in the Ethiopian private sector, by improving B2B relations, the availability and utilization of quality business information, and advice.

The TIDE project

The primary objective of The Inclusive Dairy Enterprise project is to increase milk production on farms by 25%, getting 5,000 farmers (18% women) to adopt climate change initiatives and generate an

additional € 1.2 million in investment. This in turn will create 5,000 additional on-farm jobs, generating UGX 32 billion as farm income (of which 18 % is for female headed households).

Three inter-related components were identified to achieve these objectives:

- *Services*: for a well-functioning dairy sector, appropriate and relevant services are required to be delivered by a well-regulated private sector to dairy farmers.
- *On-farm investments*: availability of finance and quality products and services, for dairy farmers to invest in (pre-selected) infrastructure on their farms.
- *Training*: a place where farmers can learn practical issue- based short courses that are relevant and applicable in their dairy farms.

Acknowledgements

This report and the cases described have been realised by many involved in the projects, the innovations, and the ESADA conference. Our gratitude goes to all contributed or thinking along in this project. Special thanks go to CTA; Fair&Sustainable Ethiopia; SNV Kenya; KMDP; Jasper van den Brink; SNV Uganda; ACTS; ESADA; the Embassy of the Kingdom of the Netherlands in Kenya, Ethiopia, Uganda; Egerton University.

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Wageningen Livestock Research
Report

The mission of Wageningen University and Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.