



2SCALE

A dairy processor expansion ambitions set in motion dairy development in Kenya

Photo: Joris Maatman | Smallholder farmer milking, Kenya

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2SCALE consortium



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KEY MESSAGE

A partnership model with a single lead firm can be the start of a larger scale intervention. In a competitive sector with shifting alliances and business relations, such as the dairy sector in Kenya, over time a diversification of partnerships can be expected and even be encouraged.

Introduction

Before the 2SCALE intervention

The dairy sector in Kenya is characterized by a high level of organization and interdependence between stakeholders in the value chain and strong market competition between different actors. Different companies in dairy processing and retailing compete with each other for the supply of milk, a large proportion of which comes from smallholder producers. Over 80 % of all cattle in Kenya is estimated to be owned by households who own on average 1-3 cows each. 45 % of all milk produced is for home consumption, while the remaining 55 % is traded. Of the traded milk, 88 % is traded as raw, untreated milk to neighbors and 12 % is traded on the formal market. The formal retail market is nevertheless well developed and pasteurized milk reaches consumers through a range of retail outlets, from small

roadside shops (*dukas*), to privately owned smaller supermarkets, to countrywide national and international supermarket chains. Different brands of fresh milk and processed dairy products are competing for the customer preference. Some dairy companies operate locally and others nationwide.

Eldoville Dairies is a family owned milk processing enterprise located 15 km from Nairobi city center. Eldoville was formally established in June 1985 by Mrs. Lucy Karuga as a backyard cottage industry. She started by daily processing 20 l of milk from a single cow into 2 kg of cream using a hand cream separator. After she was introduced to Hotel Intercontinental in Nairobi by a friend, they agreed to buy her cream. However, the hotel needed 20 kg/day of cream, but Mrs Karuga was only able to produce 2 kg/day from her single cow, which encouraged her to add more dairy cows to her farm. The hotel was impressed by the quality of the cream and, therefore, requested other dairy products. She started preparing yoghurt in addition to cream to diversify her supply to the hotel. The hotel soon introduced her to four other 5 star hotels. In just one year, demands increased to 500 l/day of yoghurt and 40 kg/day of cream, which meant she needed to start sourcing milk from other producers, in addition to the milk produced by her own cows.

At the onset of the 2SCALE program, Eldoville Dairies was an established modest-sized dairy processing company that focused on the development of high-quality products, including yoghurt, cream, cheese and whey. The company produced two types of cream (whipping cream and double cream) and several types of soft and hard cheese. At this point Eldoville was processing 5,000 l of milk per day from a total of 980 suppliers. The quality of the milk supplied to the processing factory was not to the satisfaction of Eldoville,

especially regarding the fat content, and as a result 18 l of milk was needed for the production of just 1 kg of cheese. Eldoville did develop the ambition to improve the quality of milk purchased, and to drastically increase the volume of milk processed.

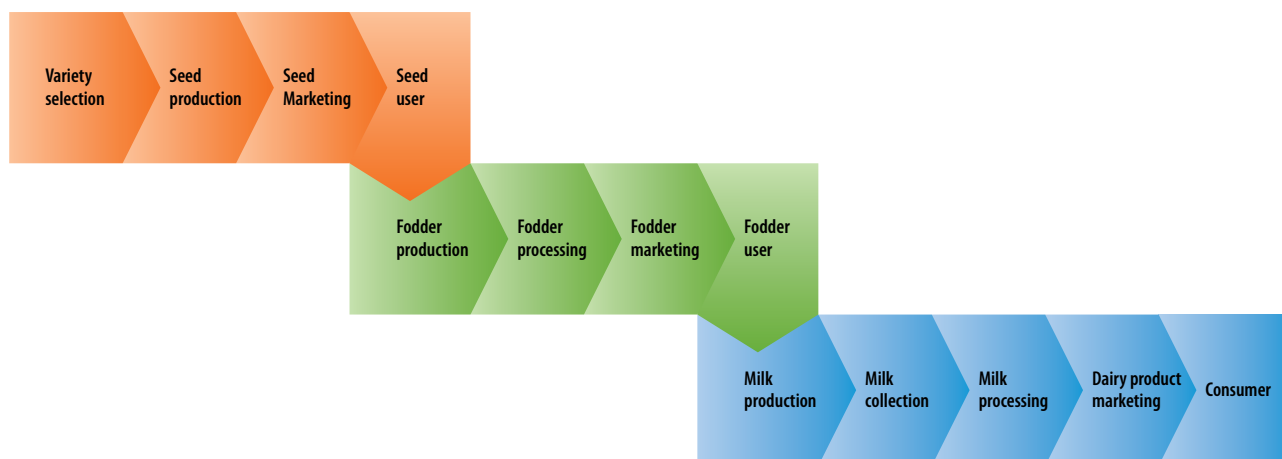
The 2SCALE partnership

Eldoville approached 2SCALE for support with its ambition to grow the company further and presented its ambition to scale up from processing a daily volume of 5,000 l of milk to establishing a new plant with a processing capacity of up to 70,000 l per day, as well as adding pasteurised and UHT milk to its product portfolio. To realise this ambition Eldoville was soliciting support from 2SCALE to assist in the organization of dairy producers to help professionalize their production and handling, and thereby improve both the quantity and quality of milk produced and delivered to the processing plant.

Through 2SCALE a partnership was forged along the interlinked dairy chains (Figure 1). Three interlinked dairy chains can be distinguished, first there is the forage seed chain, which starts with variety selection and ends at the seed user. The seed user, or fodder producer, is the starting point of the fodder chain, which ends at the fodder user or client. This is the milk producer, who finds him or herself at the start of the milk processing chain, which ends with the dairy product consumer.

Initially in each of the chains a private company was identified with an ambition to grow its business in partnership with smallholders. Advanta Seeds was selected as the designated firm for the forage seed chain; Bunda Cake as the private company to produce animal feed; and Eldoville as the lead firm in the milk and dairy processing chain.

Figure 1 | Three dairy chains: the forage seed chain, fodder production chain and the milk processing chain



Interventions of 2SCALE

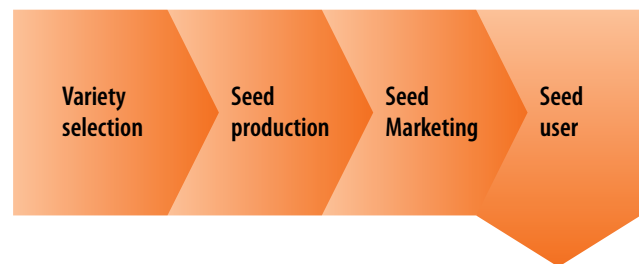
Interrelations between the different chains in the dairy sector are strong, and the actors in the sector are highly interdependent as a result. Value chain collaboration is particularly essential in the dairy chain because of the perishable nature of the product. Due to these interdependencies it was deemed appropriate to assess the constraints across the sector and intervene in the three associated chains, to improve efficiency in production and processing, as well as strengthen actor relations. 2SCALE's interventions were therefore characterized by a number of strategic interlinked activities, which simultaneously addressed the major bottlenecks identified in the dairy sector along the three interrelated chains.

The key challenges that 2SCALE identified in the dairy sector in Kenya were the low productivity during the long dry spell from January to April, and the low quality of milk (especially the low fat content). These challenges relate back to sub-optimal feeding practices, poor silaging and the limited availability of high quality fodder, which in turn are caused by the poor availability of improved varieties and seed for quality fodder production and, more generally, inadequate agricultural practices in fodder production.

Seed chain

Access to quality forage seed is a challenge for smallholder farmers in Kenya. The availability of appropriate high yielding varieties is limited, and the commercial availability of seed for these varieties is poor. Less than 20 % of forage seed traded is certified and sold through the formal market in Kenya, 80% of the traded seed does not get certified and is sold through the informal market. However, at the same time there are commercial seed companies active in Kenya with ambitions to explore the forage seed market and the potential to be the drivers of change in the forage seed chain.

Figure 2 | Forage seed chain



Partnership

The partnership facilitated by 2SCALE in the forage seed chain started with a seed company called Advanta. However, at the time Advanta only had candidate varieties of forage seed on offer for testing and registration, and no ready-to-use varieties, nor did they have a complete portfolio of forage species and varieties. During the 2SCALE intervention it became apparent that a wider partnership was required to tackle the limited availability of quality forage seed. The partnership broadened and other private seed companies (Kenya Seed, Simlaw Seed, Coopers and Barenbrug) entered into it, along with the Kenya Agricultural and Livestock Research Organisation (KALRO), Aberystwyth University and the International Centre for Tropical Agriculture (CIAT). This allowed for a broader portfolio of forage varieties and species to be tested and promoted by the forage seed producers. In addition, agro-chemical companies such as Osho Chemicals and Murphy Chemicals joined the partnership, to contribute to the intensification of fodder production.

Variety selection

The 2SCALE intervention coordinated the participatory variety selection of forage species. Farmer managed trials were run concurrently with the national performance trials necessary to register varieties and obtain a trade license. Participatory selection with farmers was conducted with 12 candidate varieties (Table 1), which were narrowed down to the four best performing varieties. The best performing commercial varieties of sorghum, oats and lucerne from Advanta, Aberystwyth University and Coopers were not immediately available as the variety registration took longer than anticipated. Already available species and varieties were therefore

selected in the meantime in order to offer farmers the opportunity to start improving fodder production immediately.

Seed production

The best performing species and varieties, according to the participating farmers, were selected for further multiplication. In the production of forage seed, both production by specialized seed companies, as well as production by individual farmers and farmer cooperatives plays a role. The production capacity of commercial varieties of forage seed was increased by involving individual smallholders and cooperatives as outgrowers of lucerne, sorghum, desmodium, oats and Boma rhodes grass seed, to supply Kenya Seed, Simlaw and Coopers. This was necessary to respond to the increased demand for forage seed resulting from the demonstration and promotion of their use (see below). Furthermore, the program supported the multiplication of Vetch and Lupin varieties originating from KALRO, which farmers were selling informally (farmer to farmer), as the varieties were still in the process of formal registration.

Seed distribution and marketing

An important component of 2SCALE's intervention focused on promoting the use of improved fodder species and varieties (see paragraph below). Through field days and participation in trade fairs, marketing avenues for forage seeds were further explored. Workshops and forums have been organized to link seed suppliers, agro-chemical dealers and input shops, and have even facilitated the negotiation of prices. These promotion efforts have increased the proportion of farmers in the participating dairy cooperatives using high quality forage seeds from 10 % (at the time of the baseline) to over 60%.

Table 1 | Forage species and varieties of seed companies and research organizations tested

Variety or number	Species	Status (registered variety and or candidate variety)	Seed Company/ Breeder
Sugar graze ⁺⁺	Sorghum	Candidate variety	Advanta Seed
Nutrifeed	Pearl millet	Candidate variety	Advanta Seed
Sorghum E1291; Sorghum E6518	Sorghum	E1291 registered; E6518 candidate variety	Kenya Seed
Columbus grass	Sorghum alnum	Registered variety	Kenya Seed
Oats S18	Oats	Registered variety.	Kenya Seed
Conway ⁺⁺ , Glamis, Balado, Mascani and Rhapsody	Oats	Candidate varieties	Aberystwyth University, UK
Haymaker ⁺⁺ , Yamoi	Lucerne	Candidate varieties	Coopers (Barenbrug)
Lucerne Aurora	Lucerne	Registered variety	Simlaw Seed.
Silverleaf desmodium	Desmodium	Registered variety	Simlaw Seed.
Sweet Lupin	Lupin	Candidate variety	KALRO
Purple Vetch ⁺⁺	Vetch	Candidate variety	KALRO

⁺⁺: indicates the four best performing varieties selected

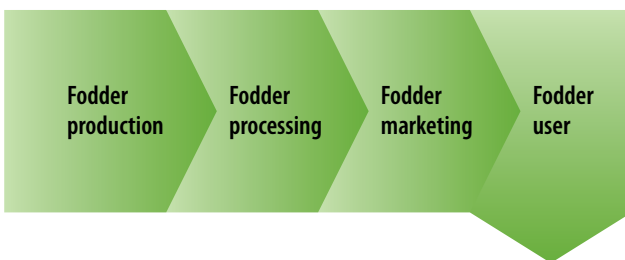


David Njenga | Making business out of hay, Kenya

Fodder chain

The vast majority of dairy farmers produce their own fodder that is fed to livestock fresh in a limited- grazing system. Very few smallholder farmers preserve fodder as silage or hay, therefore feeding in the dry season is a big challenge. Dairy farmers supplement the feed they have available themselves by buying hay, silage and concentrates.

Figure 3 | Fodder chain



Partnership

In the fodder chain intervention, at the onset the main partner was Bunda Cake, a producer, blender and trader of animal feed. Further into the intervention, however, it was decided to include more companies in the partnership, and additional collaboration was sought with Digital feeds and Total Feed.

Fodder production

Seed companies, agro-chemical companies and research organizations partnered in the training of trainers. The seed companies provided training on agronomic aspects of the new

fodder species and varieties, provided seeds for demonstration and sold seeds at the local input shops for easy access by dairy farmers and specialised fodder feed producers. The trainers were input dealers, selected farmers, milk graders, private service providers such as artificial insemination providers, animal health technicians, cooperative staff who deal with farmers on a daily basis and government extension agents. Embedding the training in the daily routines of actors in the dairy chain minimised the cost of extension services.

The training showed the benefits of using improved forage seed to increase fodder productivity per hectare. Furthermore, improved feeding strategies were demonstrated to increase milk productivity. The cooperatives mobilized farmers to attend training and ensured that the trainers received a modest remuneration for their efforts. For each training and demonstration site, plots measuring a quarter acre for each variety were planted. A total of 460 demonstration sites were established in 10 different counties and over 15,000 farmers were practically trained in the field. The trainees were generally dairy producers.

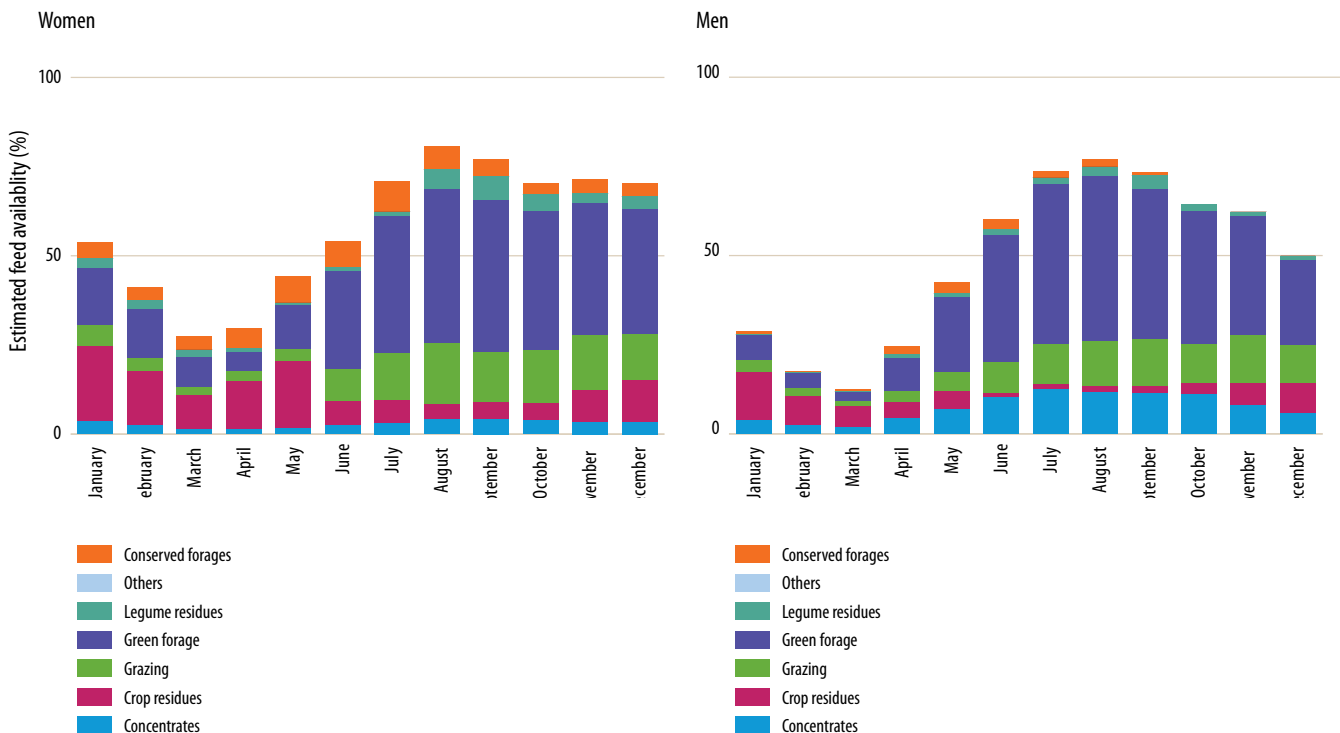
The normal practice is to feed the dairy cows with bulk home-grown feed and supplement this with concentrate. 2SCALE training has improved fodder production of participating smallholder farmers by 45%, thus contributing to the reduction of the feeding gap. In addition, some farmers have seen business in fodder production and are producing and selling surplus fodder.

Fodder processing

2SCALE, with the assistance of CIAT, assessed the seasonality of the availability of fodder in the dairy chain and was able to identify the main gaps during the year. During the most significant feed shortage from February till May, farmers can barely manage 25 % of animal requirements (Figure 4). To ensure the continuous season-long supply of fodder, even during the dry season, an improvement in fodder conservation practices was required as part of the improved feeding strategy.

The intervention focused on supporting dairy farmers to produce more fodder and to effectively process it into hay and silage for conservation. The improved production of fodder, and particularly its improved conservation, reduced the feeding gap significantly, from 75 % during the worst month of April to less than 50 %. The main feed sources are in order of importance: green forages, grazing, crop residues, concentrates. Men reported a higher use of concentrates than women, while women reported a greater use of conserved forages than men. Though the feed supply closely followed the rainfall pattern, it is noticeable that at no time was the feed supply considered adequate, with feed availability reaching an estimated maximum of about 75 % of necessary demand. The women seem better capable at approaching optimal feeding, while using less concentrates than men (Figure 4).

Figure 4 | Feed availability for Eldoville suppliers



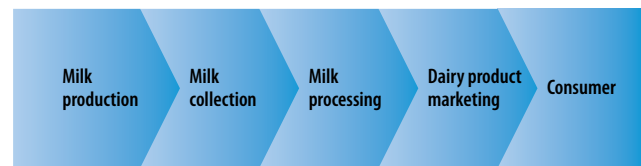
Fodder marketing

Excess fodder produced by dairy farmers and specialised fodder producers is marketed in the form of hay or silage and sold locally within farmer cooperatives or through input shops. Feed shortages are exacerbated by poor linkages and networking between the farmers facing fodder shortages and commercial fodder producers. 2SCALE has supported specialised fodder producers in exploring business relations with farmers in other regions that have a high demand for hay. Exchange visits were organised, a networking forum was established and local trade fairs organised, jointly with county governments.

Dairy chain

Fodder provides the first input into the dairy chain. The main challenge in the dairy chain is the sub-optimal feeding practices used by dairy farmers, which result in poor quality milk as well as a fluctuating supply throughout the year. The combination of these issues confronts the milk processing industry with difficulties and reduces profits for smallholder dairy farmers.

Figure 5 | Dairy chain



Partnership

At the onset of 2SCALE intervention the main partners were a dairy farmer cooperative, Nyamarura, and Eldoville. The success in improving the productivity of Nyamarura cooperative attracted the interest of nine other cooperatives and prompted 2SCALE to offer them similar support, thus increasing the scale of the intervention. Quickly it became apparent that the envisioned increase in processing capacity of Eldoville would take longer to realise. As milk production was increasing, the cooperatives started scouting for other market options for their milk and additional dairy processing enterprises were co-opted into the 2SCALE partnership. As a result the partnership began to grow organically.

Milk production

Through the 2SCALE intervention 15,000 dairy producers have been supported to improve their milk production. The main driver of their increased productivity was the use of an improved feeding strategy. Farmers received training on better balancing between different feed types and the efficient use of silage and supplementary concentrates.

The improved feeding strategy promoted through the training has proven to contribute considerably to reducing the feeding gap and improving milk productivity per cow. Detailed measurements of the effects of the improved feeding showed an average

productivity increase in the selected dairy farms of 21 % and 18 % for morning and evening milk respectively (Figure 6). In addition, a marked improvement in milk quality was reflected in the increase in fat content.

Figure 7 shows the average daily milk production of eight sample farms over the 42-day trial period. It demonstrates that the increase in milk productivity coincided with the 10-day period when the feeding intervention was implemented, after which there was a drop when reverting back to usual farmer practice.

Milk collection and reception

To further improve the quality of the milk delivered by producers to processors, milk cooling technologies were introduced in the form of village level charcoal cooling (Box 1). In addition one of the cooperatives, Nyamarura, was introduced to solar operated milk cooling technology. Through brokering by 2SCALE they obtained a loan from a financial institution for a solar operated milk cooling unit with a capacity of 4,500 l. Access to a cooled collection and bulking site allows the farmers to negotiate better prices with buyers based on their larger volumes and better quality of milk.

2SCALE supported Eldoville with an automated milk reception system, which improved the logistics and administration of the milk reception. The automated system assists in building confidence

Figure 6 | Milk production under common farmer practice compared to an improved feeding strategy, Oljoro Orok, Kenya, January 2017

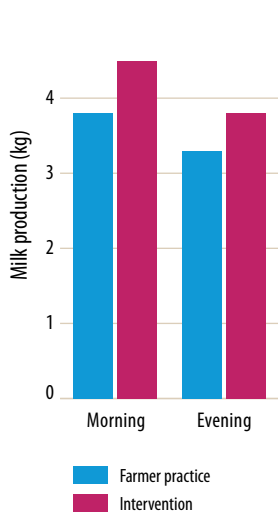
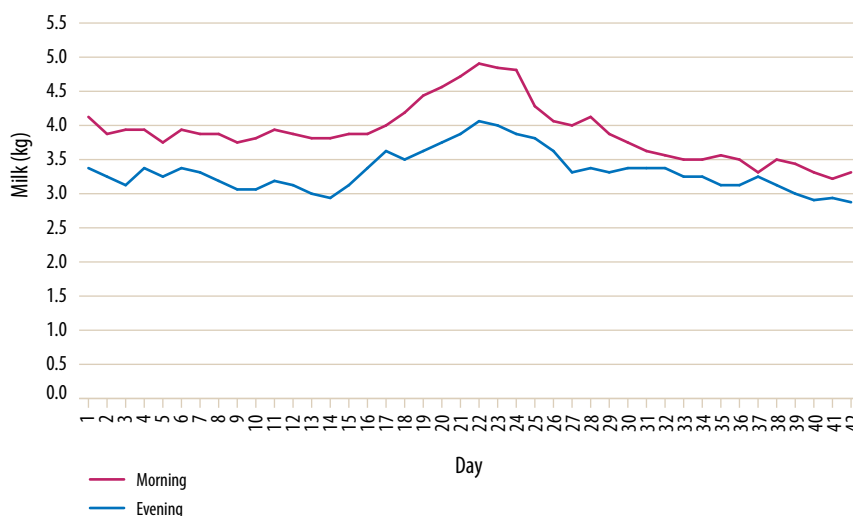


Figure 7 | Average milk production over a 6 week experimental period at Oljoro Orok, Nyandarua Kenya. The 10-day period between the arrows indicates when the feeding intervention took place





with suppliers as it provides them with accurate statements. The automated system supports full traceability of the milk from producer to processed product. The system rewards the quality of milk – measured according to the fat content – of individual suppliers with a bonus of 2 Ksh/l. In addition, it supports the suppliers by providing them with a quantitative and qualitative supply track record. This supply track record assists the dairy farmers in gaining access to credit with financial service providers.

The automated milk reception system by Eldoville has made it easier for farmers to access loans as the system assists in credit rating by keeping an individual milk delivery track record. Furthermore repayment of credit is automatic, as installments to pay off loans are withheld by Eldoville and wired directly to UMATI capital, a micro-finance provider. Up to 80 % of the farmers requesting credit do so through mobile banking. The request is received by UMATI, who verifies their credit rating with Eldoville before sending mobile cash to the farmer. This system saves time and money on other transaction costs compared to conventional banking. The processor's supply is more reliable as a result of this system due to a reduction in side selling – brought about by smallholders' need for immediate cash – which enables processors to collect more milk from suppliers. Dairy farmers are usually paid 30-45 days after supplying milk to the processor in Kenya. Over US\$1 million has been advanced to the farmers through this system between the start in 2014 and the end of 2016.

Milk processing

The high quality milk delivered by producers has allowed Eldoville to reduce the amount of milk used to make 1 kg of cheese from 18 kg to 10 kg, which has resulted in a major reduction in the production costs of cheese.

2SCALE supported Eldoville to further adapt its fruit flavoured dairy drink, Whey Cool, made from the by-product of cheese production. A processing expert, sponsored by 2SCALE, supported Eldoville to develop the ability to stabilise the dairy drink so that it does not spoil for one month without refrigeration.

Marketing

Whey Cool is an affordable dairy drink, which is particularly suitable for promoting dietary diversification at the Base of the Pyramid (BoP), the large consumer segment that has a low income. A market assessment and pilot have been implemented and confirmed the potential of the drink in the BoP market. A marketing strategy for Whey Cool has already been developed and awaits implementation, once Eldoville gets its Whey Cool production and packaging line in full operation.

Lessons learned

2SCALE's experience with dairy sector development, which started as a partnership with Eldoville as the lead firm, demonstrates a number of lessons.

Innovation along different associated value chains

The dairy sector is characterized by the complexity and interdependence of three associated chains, the forage seed chain, the fodder chain, and the dairy chain. The latter is particularly important because of the highly perishable nature of milk. The 2SCALE intervention has shown effectively that parallel and coordinated intervention along the three associated chains in the dairy sector can provide improved efficiency, increased smallholder income and employment, and greater processor competitiveness.

The key to successful intervention was addressing the core constraint of the sub-optimal feeding strategies used by dairy producers. Even though the training and demonstration of improved feeding techniques were an essential component of the intervention, more input was required in the form of innovations along the associated seed, fodder and milk chains. To address feeding inefficiencies downstream changes were necessary, which included increased access to and use of improved varieties of new forage species, as well as improved fodder production and handling practices. At the same time, upstream incentives were developed in the form of premiums for improved milk quality, as well as improved cooling techniques and innovative solutions for access to credit.

Productivity and quality improvements as drivers for development

At times, interventions that focus on improved productivity as the basis for livelihood improvement are frowned upon. However, this case of dairy sector development in Kenya demonstrates that an intervention based on increased productivity can be successful, and that productivity and quality improvement can be drivers of development.

Apparently the presence of a strong, competitive and growing market for milk and dairy products in Kenya can absorb the large scale increase in productivity. The 2SCALE program had initially targeted Eldoville's plans to increase their processing capacity. However, the increase in dairy farmers' productivity exceeded the increase in capacity, and thus the demand for milk of Eldoville. Still, the producers who had been increasing their supply were able to find competing buyers, offering similar and, in some cases, even better prices than Eldoville. The increased quality of the milk, and its bulk availability, made it relatively easy to attract buyers for the increased volumes resulting from better feeding.



David Njenga | Demonstrating milk quality testing, Kenya

Diversification of partnerships for success

The dairy sector intervention demonstrates that to have success in complex value chains, in a market with existing competition between private companies, a strategy that works with multiple – possibly even competing – private companies, operating in different components of the sector, can be effective. It is even likely to better respond to the need of producers, and takes better advantage of the strength of the competitive market.

In a dynamic competitive market, different actors negotiate based on the quality of their services or produce. When there are competing buyers in the market, it is advantageous for producers to keep their options open and seek a business relationship that responds best to their demands, which may not always be the highest payer. Other advantages that buyers can offer may be in the form of service provision, timely collection, reliability, or quite importantly, the speed of payment. An important characteristic to consider in a business partner is a proven willingness to invest effort in co-innovation for the mutual benefit of the dairy producers and the processor, as in the case of Eldoville.

In the seed chain, several other companies became involved in addition to the private enterprise initially participating, which allowed an increase in the number of options of forage crops and varieties available to farmers. This provided farmers with better services compared to the offer of the single company initially identified.

Importance of a facilitating value chain organization

The dairy case has realised improvements in efficiency in different segments of the interrelated dairy chains. At the same time, only existing technology and insights have been used. Key to the intervention's success has been the role of 2SCALE as an independent interlocutor or facilitator between different actors in the sector. This includes agricultural research (e.g. KALRO, CIAT), private seed companies and seed producers, feed companies, dairy processors, individual milk producers, milk producer groups and dairy farmer cooperatives. The 2SCALE facilitators have been instrumental in identifying opportunities along the associated chains, building relations, triggering pilots and linking actors with promising technologies.

Scaling through the organic growth of partnerships

The scale of the intervention in the dairy sector in Kenya is growing organically. The first successful partnership between Eldoville and dairy producers generated interest from a number of additional dairy cooperatives wishing to address the same issues within their own organizations. This provided the 2SCALE intervention with an organic way to scale up the intervention, and build on the experience with Eldoville. The successful intervention in the dairy sector in Kenya has also inspired interventions in Uganda, Ethiopia and Mozambique. Stakeholders in dairy sector development in these countries have visited Kenya to learn from its experiences, which assisted them in designing similar initiatives.

Strong interdependence among actors allows for smart finance innovations and embedded services

The dairy case in Kenya also demonstrates that, within the sector, innovation in financial service provision is more than possible. Because of the strong interdependence between market actors, and the traceability of the product, innovative ways of offering credit against low transaction costs were able to be piloted and showed great promise of success at scale.

Partnership can develop from a single lead firm into a diverse collection of partnerships

The main lesson from the dairy intervention is that a partnership model with a single lead firm can be the start of a larger scale intervention. In a competitive sector with shifting alliances and business relations, such as the dairy sector in Kenya, over time a diversification of partnerships can be expected. This diversification is welcome as interrelated bottlenecks require

different, sometimes competing, actors to find solutions. It does, however, require facilitation and negotiation to ensure continuation with the initial partners is not harmed. Long term collaboration and relationships are key to working on complex innovations.

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BOX 1 | CHARCOAL IS COOL!

Milk collection logistics are a major challenge for both farmers and processors. Cows are milked twice a day, morning and evening. The milk is susceptible to spoilage and bacterial contamination. Dairy farmers in Nyandarua, Kenya, suffered substantial losses because they lacked refrigeration facilities.



David Njenga | Simple low-cost milk storage sheds made form charcoal, Nyandarua, Kenya

A charcoal cooler is a simple structure of 2 x 2 x 2 meters, made of a wooden frame and chicken wire walls filled with a six-inch thick layer of charcoal pieces held together by the wire mesh. The charcoal is kept moist. This allows to keep milk below 10 degrees overnight, cool enough to ensure that no significant degradation occurs before the milk is transported the next morning.

A small cooler with a capacity to store 200 l of milk, enough for small-scale dairy farmers, costs about \$130 to build. Farmer managed testing shows spoilage of evening milk to reduce from over 50 % to less than 5 %. The investment in a cooler pays for itself in less than 3 months.

Local artisans were trained on how to build coolers and Eldoville Dairies is partnering to promote the new cooler among its suppliers.



Joris Maatman | Quality control

This paper is part of a series in which 2SCALE facilitators and coordinators share their experiences. Contributors: Abalo Adodo, Grégoire Oniankitan Agai, Mathias Ahounou, Geneviève Audet-Bélangier, Tekalgn Ayano, Judith Chabari, Assefa Degefu, François Dossouhoui, Peter Gildemacher, Olugbenga Stephen Idowu, Alhassan Issahaku, Peter Kiriimi, Eric Lakoussan, Arnoldus Maatman, Janet Macharia, Douglas Magaja, Jacqueline Ndambuki, David Njenga, Irene Njogu, Francis Nthuku, Thompson Ogunsanmi, Gabriel Olengo, Kwame Pipim, Hiwot Shimeles, Faoussa Tadjou, Addis Teshome, Baba Togola, Mahamane Toure, Youssef Traore, Niek van Dijk, Ajay Varadachary, Raphael Vogelsperger, Allan Wayira and Bertus Wennink.

2SCALE manages public-private partnerships (PPPs) for inclusive agri-business in Africa. Partnership agreements are developed with companies with inclusive business agendas. 2SCALE offers support services to companies, farmer groups and other relevant stakeholders – enabling them to produce, transform and supply quality food products to local, national and regional markets, including Base of the Pyramid consumers. 2SCALE strengthens the capacity of grassroots and value chain actors, supports innovation and coordinated action, and improves skills to assure effective participation in markets. The focus countries of the programme are Benin, Ethiopia, Ghana, Ivory Coast, Kenya, Mali, Mozambique, Nigeria and Uganda.

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