



# Institutional and technological innovations to foster agro-industrialization in Uganda

## Insights from the dairy value chain

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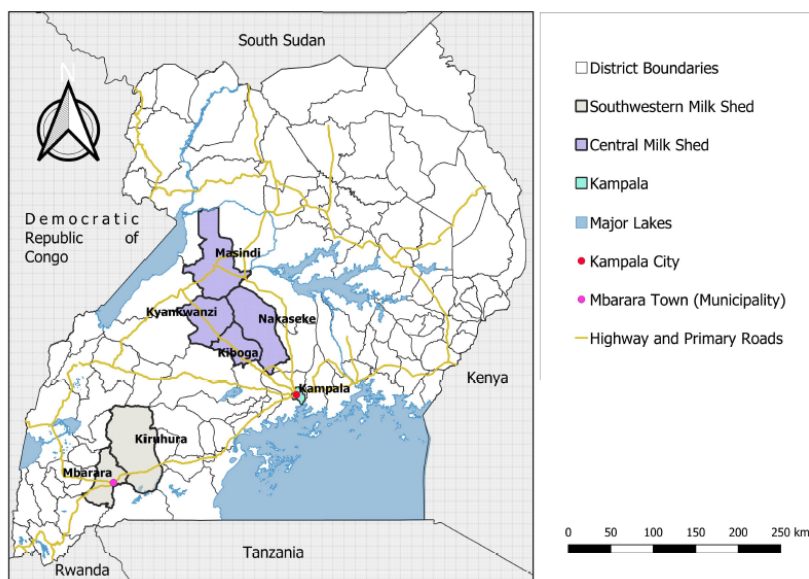
This policy note summarizes findings from a dairy value chain study in Uganda that documented the institutional and technological innovations associated with the transformation of the sub-sector from a USD 2 million industry in 2008 to a USD 150 million industry in 2017. Uganda is now one of the largest exporters of dairy products in Africa. Using primary data obtained from dairy farmers, traders, and processors, we examine the drivers of this transformation of Uganda's dairy sub-sector. The insights gained can guide policy and investment decisions for upgrading other agricultural value chains that have been prioritized for agro-industrialization in the medium- and long-term national development plans of Uganda.

## Background

According to the Uganda National Development Plan (NDP) III, Uganda will, for the period 2020/21 to 2024/25, focus on promoting agro-industrialization, prioritizing 11 selected commodities, including the dairy value chain. Agro-industrialization is expected to encompass increased agricultural production and productivity; increased agro-processing, value addition, and storage; increased agricultural product competitiveness in domestic, regional and international markets; and increased access to agricultural finance services.<sup>1</sup> Studies elsewhere show that for agro-industry to develop, both institutional innovations that attract investors and technological adoptions that improve efficiency are key. For instance, in Senegal, growth in an integrated vegetable value chain has been associated with development of a modern agro-industry that was built by local and foreign investors responding to opportunities created by demand in EU countries.<sup>2</sup>

As the Government of Uganda continues to promote agricultural transformation, it is important to provide evidence on the key drivers of agro-industrialization. Agricultural value chains in developing countries, including Uganda, are rapidly changing both in terms of actors and activities. Yet, the majority of Uganda's agricultural value chains are characterized by low-value agricultural markets. They have only limited integration into formal high value markets that demand products requiring more processing, have stronger quality controls, and which target higher-income consumers. Export markets make up less than 10 percent of the market share for agricultural

**Figure 1: Map of Uganda showing the two milk sheds examined in the study**



commodities in Uganda – the bulk of exports are made up primarily of tea, coffee, fish, and increasingly dairy.

The Ugandan dairy value chain provides a good case for studying and understanding the pathways to value chain upgrading and, hence, agro-industrialization for other value chains in the country. First, while Uganda’s other top agricultural exports – coffee, fish, and tea – mainly experienced export-led innovation, the dairy supply chain caters for both domestic and international markets. Secondly, the dairy sub-sector was largely

informal before 2012 with significant supply uncertainties at the level of the processors, leading to skepticism about the future of dairy industry as a strong export sector.<sup>3</sup> That the dairy sub-sector was able to reform its structure and performance to become a leading agricultural sub-sector in terms of exports is worth studying and benchmarking.

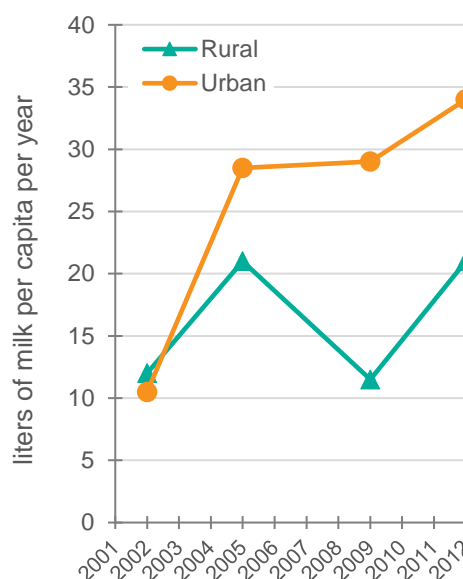
This note summarizes key findings from a recent detailed study that assess the importance of various innovations in modernizing the dairy sub-sector in Uganda over the past decade.<sup>4</sup> We use observational data collected at different nodes within dairy value chains to compare and assess the structure, conduct, and performance of actors located and operating in the export-oriented Southwestern milk shed to the more domestic market-oriented Central milk shed (Figure 1).

## Dairy consumption and dynamics in domestic and export markets

Estimates from four waves of the Uganda National Household Survey show that national annual per capita consumption of liquid milk in Uganda has increased significantly since 2002 (Figure 2). The increase in consumption occurred mainly in urban areas. Generally, this increase in milk consumption can be linked to a decrease in national poverty over the same period: An increase in disposable income resulted in consumption of more dairy products, which are known to be highly income elastic.<sup>5</sup> The consumption shown in Figure 2 is only for liquid milk. However, Ugandans also consume dairy products in other forms, e.g., ghee and *bongo*, a form of buttermilk, in rural areas. Consequently, the consumption of dairy products may be substantially higher than the levels shown.

There has also been an exponential increase in the dairy export sector, particularly since 2014 (Figure 3). This growth coincided with the

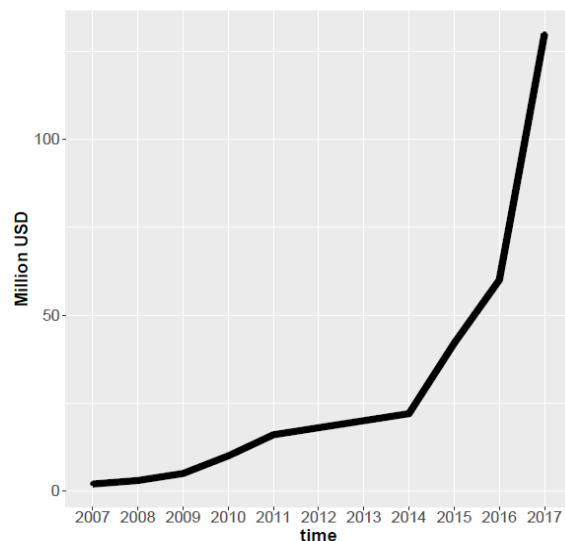
**Figure 2: Consumption of liquid milk in Uganda, 2002 to 2012, liters per capita per year**



Source: Uganda National Household Surveys, four waves.

establishment of milk processing plants, particularly in the Southwestern milk shed, which increased processing capacity and the production of dairy products targeted for export markets. Data obtained from the Dairy Development Authority (DDA), show that USD 130 million worth of dairy products were exported in 2017. The DDA reports that almost half of the export value, USD 55 million, was exported by a single processor, Pearl Dairy, which exports mostly milk powder to countries on the Arabian peninsula and to Nigeria. About 20 percent of the total export value goes to mostly neighboring countries through Brookside Ltd. Smaller processors, such as Lakeside Diaries Ltd., specialize in other locations, such as South Sudan.

**Figure 3: Export value of dairy products from Uganda, 2007 to 2017, millions USD**



Source: Dairy Development Authority, 2017/18.

## Innovations driving transformation in the dairy value chain

Using primary data from 1,600 milk producers, 700 traders, and 100 milk collection centers from the Southwestern milk shed (Mbarara and Kiruhura districts) and the Central milk shed (Kyankwanzi, Kiboga, and Nakaseke districts), we explored key innovations that are both causes and consequences of the transformation in the dairy sub-sector in Uganda.

The central innovation is the proliferation of milk collection centers (MCCs), which, in turn, enable other innovations along the dairy value chain. In addition to bulking raw milk, MCCs provide other support services which enable farmers to produce enough milk and to maintain milk sanitation levels necessary for a modern export sector. Key complementary innovations identified include adoption of high yielding animal breeds and other intensification practices around pasture and water use; adoption of improved quality milk preservation and transportation practices; and a shift in financing from family or friends to more formal sources. These innovations are more pronounced in the Southwestern milk shed that attracted the bulk of foreign direct investment, mainly in the form of processing capacity for the export market.

Table 1 highlights innovations that were observed to be correlated with dairy value chain transformation and upgrading over the past decade. For each, we present the difference in its intensity between the two milk sheds studied and its associated impact on value chain up-grading.

The key technological innovations identified are:

- adoption of high-yielding animal breeds and other intensification practices around pasture and water use; and
- adoption of improved milk preservation practices, such as the use of aluminum containers and motorbikes for transport.

The key institutional innovations identified are:

- a proliferation of milk collection centers;
- cooperation among actors;
- value chain financing with some shift to more formal financing; and
- favorable government policy for foreign direct investment in dairy.

**Table 1: Technological and institutional differences between the milk sheds and the related impact on value chain upgrading**

Technological and institutional differences between milk sheds				
Innovation	Measurement indicator	Southwestern milk shed	Central milk shed	Impact of innovation on value chain upgrading
<b>Proliferation of milk collection centers (MCC)</b>	Density of milk collection centers measured by average distance in kilometers to the nearest MCC.	5.4	10.0	MCC provide bulking, credit, training, quality control, and other services to farmers, enabling them to further innovate to produce sufficient milk and maintain milk sanitation levels necessary for the modern export sector. Because of their aggregation and organizational advantages, a large presence of MCCs attracts investments from processors, as was the case of foreign direct investment in the Southwestern milk shed.
<b>Cooperation among actors</b>	Dairy farmers that are dairy cooperative members, percent share.	21.0	9.0	While most of the cooperatives in the dairy value chain have evolved from MCCs, we find that cooperatives, compared to MCCs, are stronger in facilitating technological transformations and fostering farmer loyalty to ensure a sustained supply of milk to processors.
	Traders that are members of dairy cooperative, percent share.	36.0	40.0	
	MCCs that are cooperatives, percent share.	53.0	29.0	
<b>Adoption of improved animal breeds</b>	Exotic cows as share of all dairy cows in the milk shed, percent.	87.0	45.0	The adoption of higher yielding cows is necessary to increase the supply of milk. In our sample, a crossbred cow produces on average 5.7 liters of milk per day, while a local cow only produces about 3.0 liters.
<b>Value chain financing – towards formal financing sources and away from friends and family</b>	Share of farmers taking a loan to invest in dairy, percent.	19.6	9.1	Financing for value chain upgrading is needed to relax capital constraints and operational costs.
	Share of traders and transporters taking a loan to invest in dairy, percent.	12.4	20.9	While access to finance or credit in the dairy value chain is still low, farmers who took loans for dairy used the money to get treatment for their animals (44%), to buy improved cows (34%), or for artificial insemination (5%).
	Main source of financing for farmer.	VSLA (49.3%)	VSLA (48.7%)	Most traders used credit as working capital to buy more milk from farmers (about 30%), while others (27%) used it to buy motorbikes to improve milk transportation and reduce the amount of time between milking and chilling.
	Main source for traders and transporters.	Bank (47.4%)	Cooperatives (43.4%)	
<b>Government policy on investment and product promotion.</b>	Presence of foreign direct investment in dairy value chain.	Higher, due to low price & organizational advantages in the region	Lower	Through privatization and various tax breaks, foreign direct investment into dairy processing increased, especially in the Southwest. These investments supported value chain upgrading by relaxing capital constraints, facilitating transfer of technology and knowledge, and strengthening linkages to modern export markets. Also, Government actively promoted the dairy sector by encouraging dairy farmers to unite in cooperatives and set up their own milk collection centers.
<b>Improved water management techniques</b>	Share of farmers using own dam as water source, percent	70.0	12.0	The water source influences water availability. We found that 12 percent of farmers in the Central milk shed reported having trouble getting sufficient water for their dairy activities, while this is only 8 percent in Southwest.
<b>Quality milk preservation</b>	Share of farmers using aluminum buckets and cans, percent	64.5	19.5	The introduction of aluminum buckets and cans to increase the quality of milk is an important innovation. Aluminum milk containers are becoming the norm in the export-led Southwestern milk shed. Paying attention to quality considerations along the value chain is critical to increasing product competitiveness in domestic, regional, and international markets.
	Share of traders and transporters using only aluminum cans, percent	58.8	10.3	

Source: Van Campenhout, Minten, and Swinnen (2020). VSLA = Village Savings and Loan Association.

## Conclusion and recommendations

Sustainable upgrading of agricultural value chains into high value markets requires policies and interventions which nurture an attractive investment environment and facilitate technology transfer and adoption by producers and processors. The policies and interventions will be more effective if they target actors at different levels in both domestic and export led value chains.

Specifically, for investments seeking to upgrade and industrialize any agricultural commodity value chain in Uganda, we recommend:

- Continue to create an enabling environment for investment in the (sub-)sector or value chain. This may include setting up (sub-)sector promotion agencies and regulatory bodies.
- Focus on developing aggregation and value addition services, like milk collection centers. If product traceability is an issue in the sub-sector, cooperatives may be a suitable organizational form to safeguard quality.
- Increased investment in mid-stream services, such as the provision of training or the supply of quality inputs, price information, insurance, and credit.
- Increased attention to quality considerations along the value chain. This is critical to increasing product competitiveness in domestic, regional, and international markets.
- Increased adoption of improved inputs and production techniques to increase supply. This includes developing improved varieties that are less susceptible to pests, diseases, and weather extremes.
- Supporting innovations for longer run credit with better interest rates from formal sources.
- Strengthen supportive industrial services, e.g., packaging, to reduce costs of processing.

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## ENDNOTES

<sup>1</sup> National Planning Authority. 2020. *National Development Plan III (NDPIII), 2020/21-2024/25*. Kampala: Government of Uganda.

<sup>2</sup> Maertens, M. 2009. "Horticulture exports, agro-industrialization, and farm-nonfarm linkages with the smallholder farm sector: evidence from Senegal." *Agricultural Economics*, 40: 219–229.

<sup>3</sup> Shepherd, B. 2016. *Uganda: Improving export performance*. Policy Paper F-38213-UGA-1. London: International Growth Center.

<sup>4</sup> Van Campenhout, B.; B. Minten; and J. Swinnen. 2019. *Domestic versus export-led agricultural transformation: Evidence from Uganda's dairy value chain*. IFPRI Discussion Paper 1883. Washington, DC: International Food Policy Research Institute (IFPRI).

<sup>5</sup> Colen, L., P. Melo, Y. Abdul-Salam, D. Roberts, S. Mary, and S.G.Y. Paloma. 2018. "Income elasticities for food, calories and nutrients across Africa: A meta-analysis." *Food Policy* 77: 116-132.

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