Pathways to Dairy Net Zero: Promoting Low Carbon and Climate Resilient Livestock Uganda-Market study

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Objectives

- **Deep dive on barriers to adoption among enterprises** and **how to address them** with scaling high-potential farmer engagement models that enable smallholder farmers' adoption of solutions
- **Identify investable pipelines** involving value chain actors and supporting local and regional enterprises that increase affordable access to key inputs, equipment and technologies
- **Prioritise solutions to drive productivity, climate adaptation and mitigation** from farmgate to end markets and **map relevant segments of cooperative aggregators and processors**
- **Synthesise implications for creating an enabling environment** for processed dairy sector growth and adoption of climate-smart solutions, which include supporting:
  - **Access to finance based on enterprise needs vs. current availability in the market**
  - **Government investment**
  - **Policy and regulations for subsidies and incentives, infrastructure investments (including human capital and data digitalisation) and public procurement**

Methodology

- The market assessment is based on recent studies and literature on the market and Dairy sector, supplemented by data and interviews from key value chain actors and expert researchers, including representatives from the Ministry of Agriculture, Animal industry and Fisheries, members of the Dairy Development Authority (DDA), chairman of Uganda National Dairy Traders Association; chairman of the Ntungamo Dairy farmers cooperative Union; a representative from the National Alliance of Agriculture Cooperatives; chairman of Uganda Clean Energy Association; a representative from Ministry of Energy ; UN Capital Development Fund (UNCDF); Uganda Development Bank (UDB). Information was also obtained from development organizations like the Netherlands Development Organization (SNV), Heifer International, Agricultural Business Initiative (ABI).

- The sample size of the data collected includes ;
  - 5 cooperatives/ aggregators
  - 6 milk traders (informal channel)
  - 11 processors (5 large scale and 6 small scale)
  - 12 supporting enterprises (value chain support services)

- Information from the survey is indicated in orange boxes, for ease of identification (as compared to overall/ national data)

Agenda

Dairy sector overview

Productivity & climate solutions

Supporting enterprises

Access to finance

Government's role in enabling sector transformation

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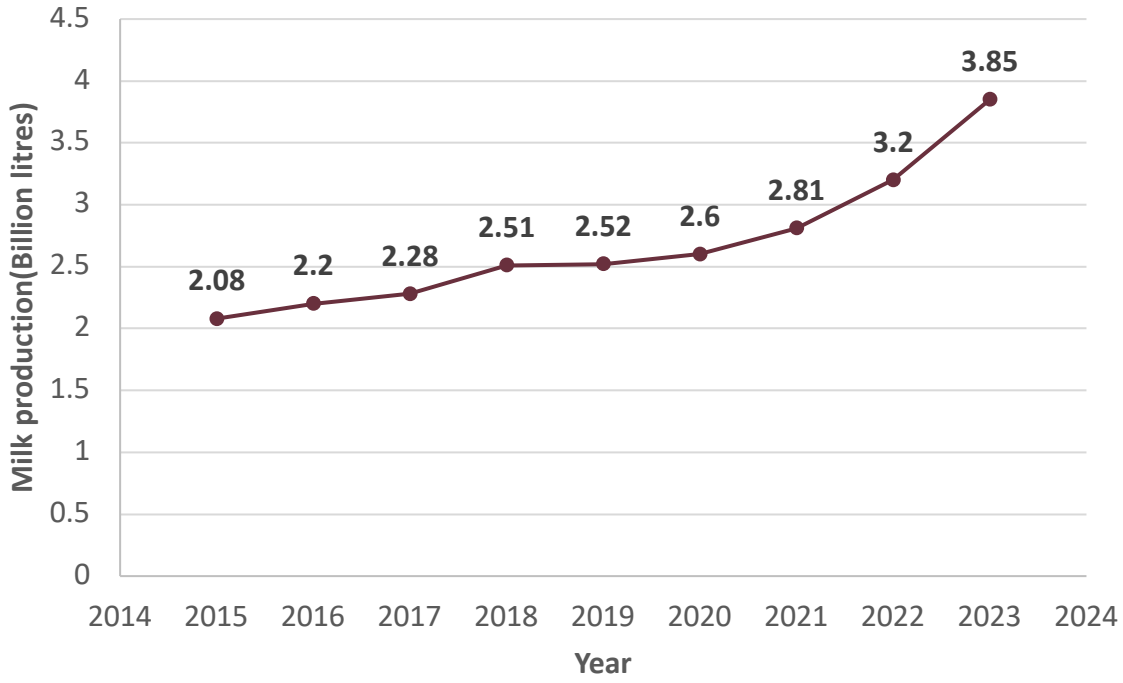
Milk production trends in Uganda

- The dairy sector accounts for **9% of the nation's agricultural gross domestic product (GDP)**
- One of the **fastest growing and most organized** livestock sub sectors, **contributing 50% to livestock** GDP.
- It contributes to the livelihoods of **1.2 million dairy farming households**
- In 2019, Uganda had **13.8 million cattle**
  - There was about **13 million indigenous** and about **918,000 exotic cattle**
  - The number of cattle **increased 13.6%** from 2015
- Annual milk production **increased to 3.85 billion litres (L)** in 2023 from 3.2 billion L in 2022
- Obtained from an estimated 4.14 million heads of milked cows. Each cow was estimated to produce 492.8 liters of milk per lactation.

Annual milk production estimates, 2015-2023



- According to DDA, from a herd of about **14 million cattle** total milk production in the current financial year 2022/23 is **3.85 billion litres** up from 3.2 billion for the previous year (2021/22) which represents **a 19% rate of increase. This has been attributed to better rains**

Sources: https://naads.or.ug/milk-coolers/ (accessed on 27/7/2023) 11:45am; Javira Ssebwami (18 May 2022). "Milk production jumps to 2.8billion liters". PML Daily. Kampala, Uganda. Retrieved 19 May 2022.; Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

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Dairy production systems in Uganda

	Traditional system				Commercial system		
	Smallholder extensive	**Medium-holder extensive**	**Agropastoral**	**Pastoral**	**Small holder intensive**	**Medium-holder intensive**	**Large-scale producers**
Farm and farmer characteristics	• Farm size 2 ha • Access leased & communal land • Subsistence milk production & only sell surplus • Rely on informal market for sales • No commercial feed	• Use of hired labour for grazing • Morning milk sold to cooperative or rural rural milk traders. • Evening milk consumed at home	• Main activity is cash crop farming • A mix of indigenous and low-grade cross breeds • Extensive grazing & use of crop residues	• Semi-nomadic farming system • Extensive grazing on unimproved pastures • Use more of family but can hire labour • Milk production is for home-consumption and processing traditional products e.g., ghee	• Typically, zero-grazing • Improved breeds	• Paddocking system • Improved breeds	• High investment in farm infrastructure e.g. farm equipment • Use of commercial feed • Pure exotic and crossbreed cows
Herd	• 1-3 indigenous cows	• 4-13 indigenous cows	• 30-40 indigenous and improved cows	• 40-60 indigenous cows	• 1-3 cows	• 10-20 cows	• 20-200 cows (Average of 30 improved cows)
Milk yield	• 1-2.5 liters per cow/day	• 1-2.5 liters per cow/day	2-5 liters per cow/ day	• 1-2 liters per cow/day	• 5-8 liters per cow/day	• 8-10 liters per cow/day	• 20-30 liters per cow/day

Dairy cattle distribution by production system and region

Region	Total (Million head)	Traditional Dairy systems				Commercial Dairy systems			Share by region
		Small-scale extensive	Medium-scale extensive	Pastoral	Agro-pastoral	Small-scale intensive	Medium-scale intensive	Large-scale intensive	
Central	2.9	129,266	575,368	585,323	1,575,047	24,411	45,307	18,268	21%
Eastern	3.0	56,354	380,384	161,512	2,398,931	16,133	22,519	4,179	22%
Northeastern	2.7	11,229	56,814	2,362,731	340,761	0	0	0	20%
Northern	2.0	42,669	185,856	142,313	1,627,776	4,251	6,961	1,227	15%
Western	3.1	204,705	791,032	536,727	1,490,836	18,015	55,465	5,558	22%
Totals and share of total	**13.8**	**444,223 (3.2%)**	**1,989,453 (14.3%)**	**3,788,606 (27.3%)**	**7,433,351 (53.6%)**	**61,810 (0.4%)**	**130,252 (0.9%)**	**29,232 (0.2%)**	**100%**

The western region is divided into two milk sheds (midwest and southwest); Source: FAO, New Zealand Agricultural Greenhouse Gas Research Centre, 2019. Options for low emission development in the Uganda dairy sector - reducing enteric methane for food security and livelihoods. Rome, p. 39 pp.

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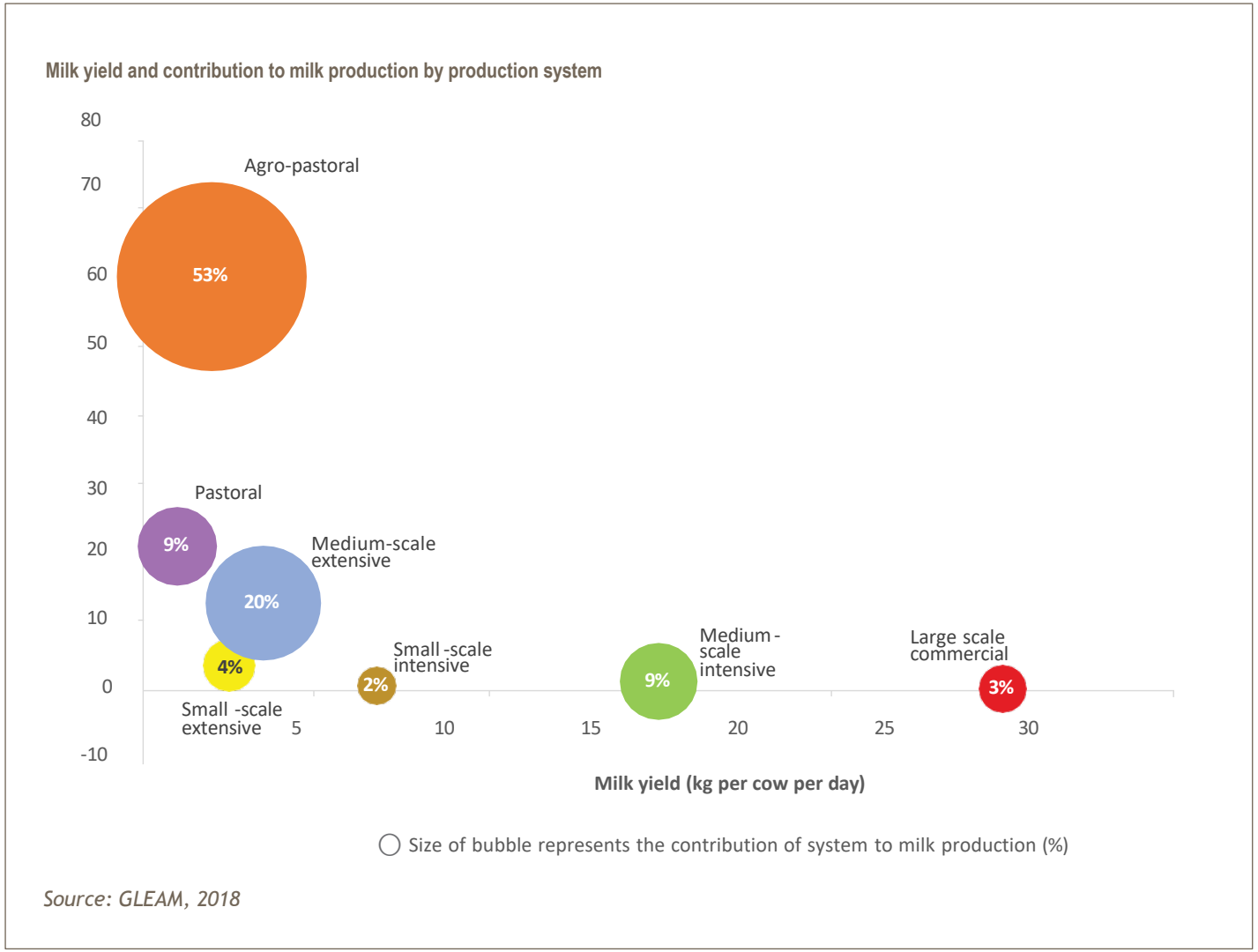
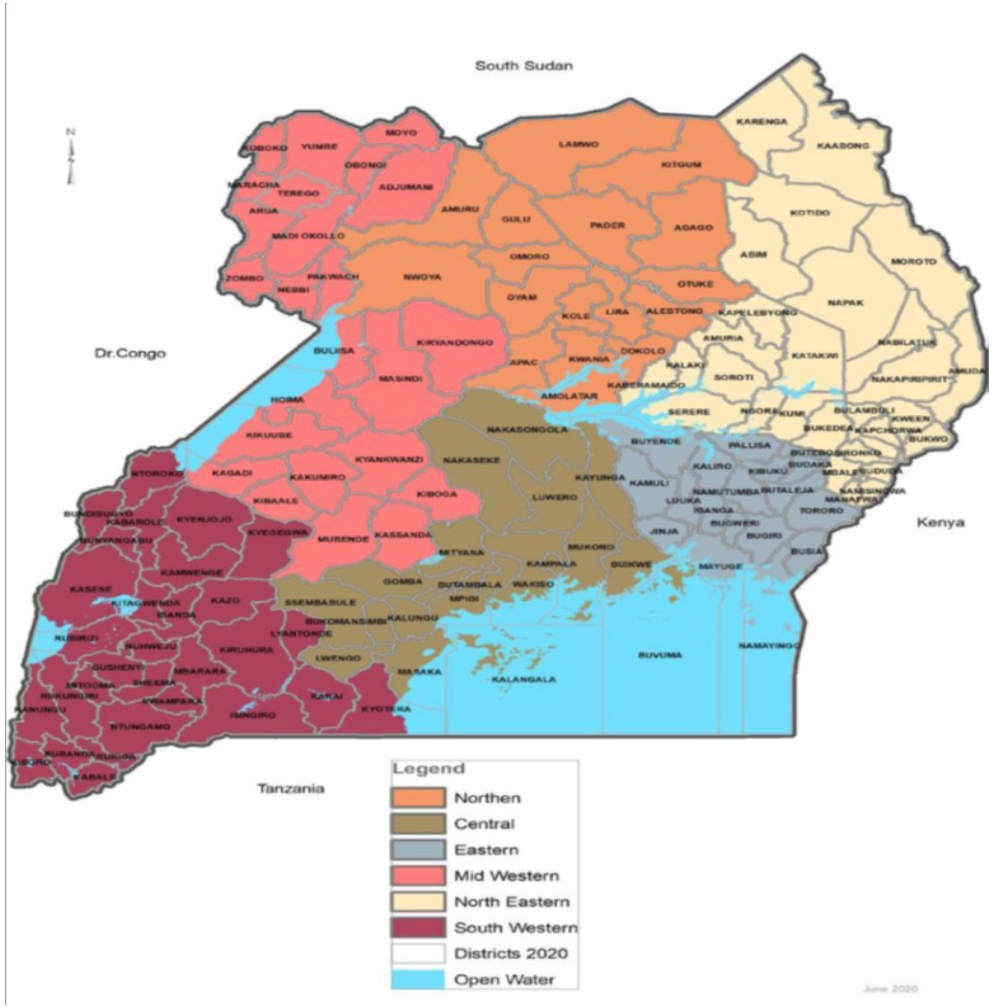
Milk yield by production system in Uganda

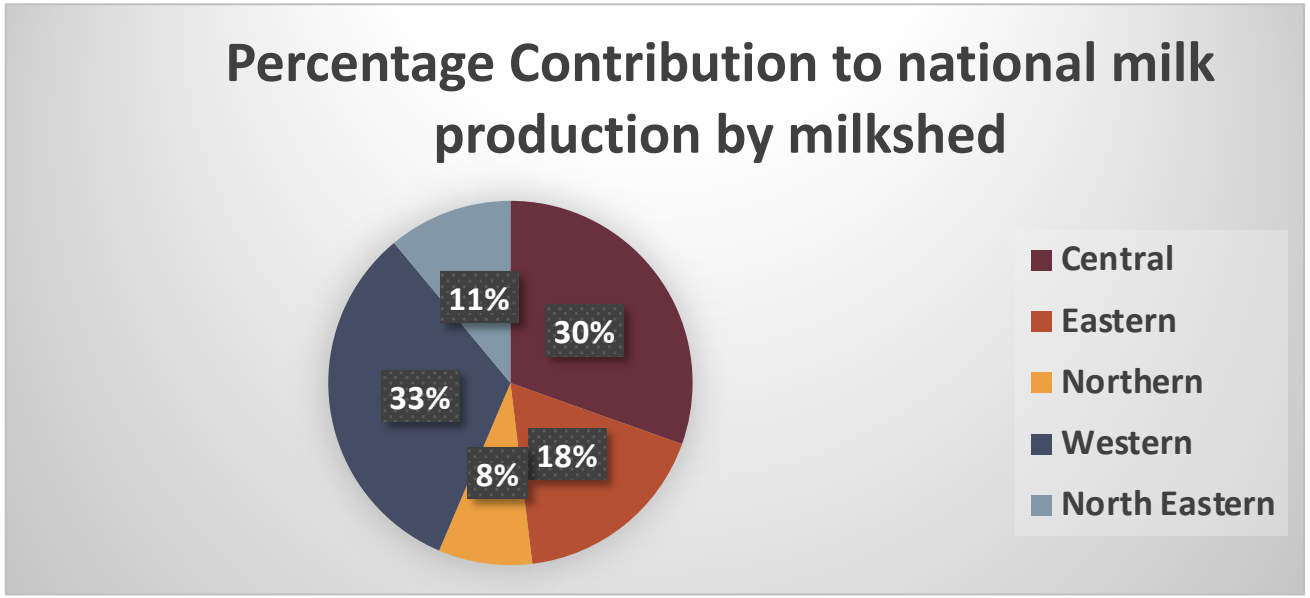


- Agro-pastoral systems produces 53% of the total milk produced in Uganda where about 49% of cattle are found. Implying this production is as result of high livestock numbers rather than production per cow.
- The pastoral systems produced 9% of the total milk where 41% of the cattle are found. However near to half of the cattle population are for beef production.
- The semi-intensive systems (small, medium and large scale) produces 42% of the milk where about 10% of cattle are found.

Source: FAO, New Zealand Agricultural Greenhouse Gas Research Centre, 2019. Options for low emission development in the Uganda dairy sector - reducing enteric methane for food security and livelihoods. Rome, p. 39 pp.

Milk production by sheds



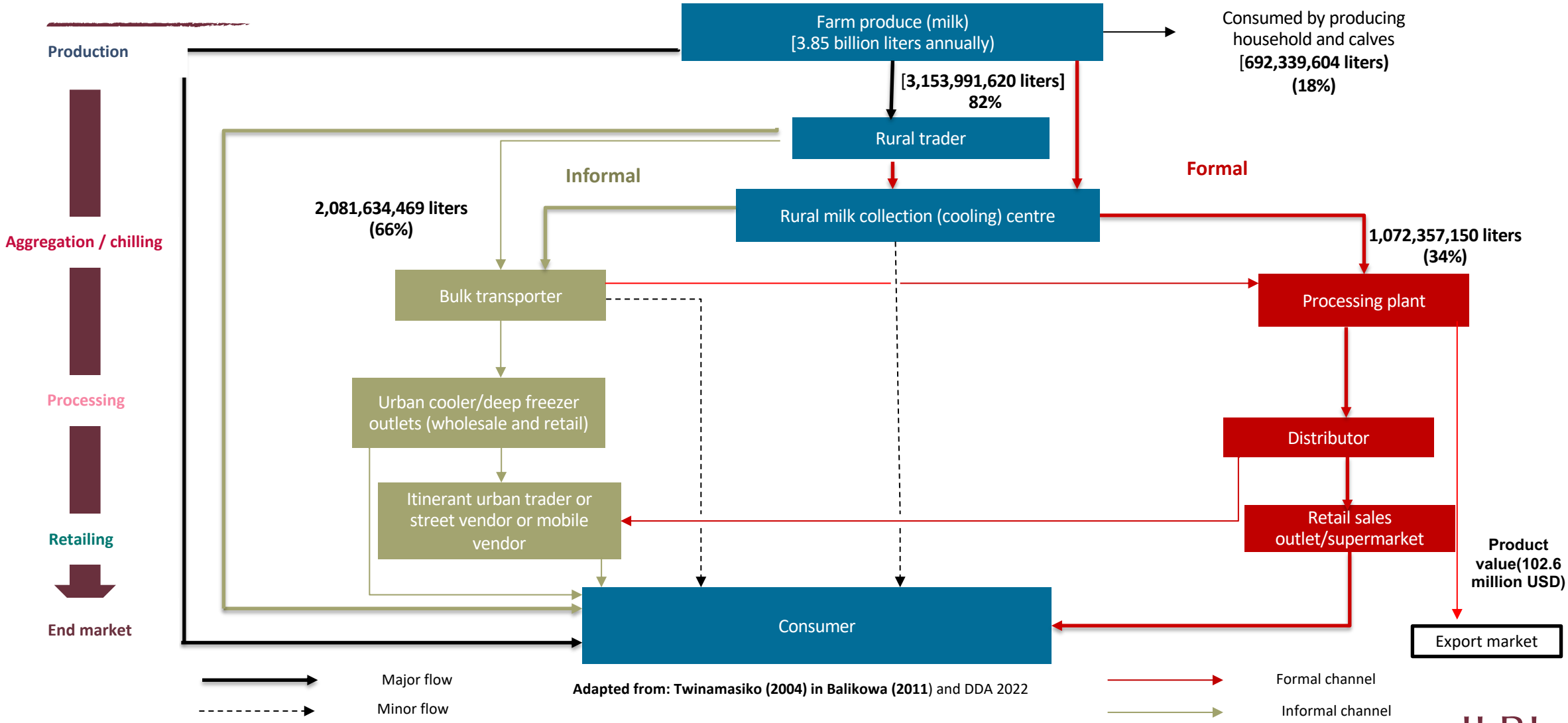


Contribution to National Milk Production

- **Central (30%), Western (33%)** ,Northern (8%), northeastern (11%), and eastern (18%)
- The western region is divided into **two milk sheds (mid-west and southwestern)**
- Most of the milking cows are distributed across the western and central regions, representing **57%** of the total milking cows and accounting for **61%** of the national milk production
- The northern and Northeastern regions, hold **21%** of the milking cows

Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

Milk Flow through the Formal and Informal Marketing Channels



Adapted from: Twinamasiko (2004) in Balikowa (2011) and DDA 2022

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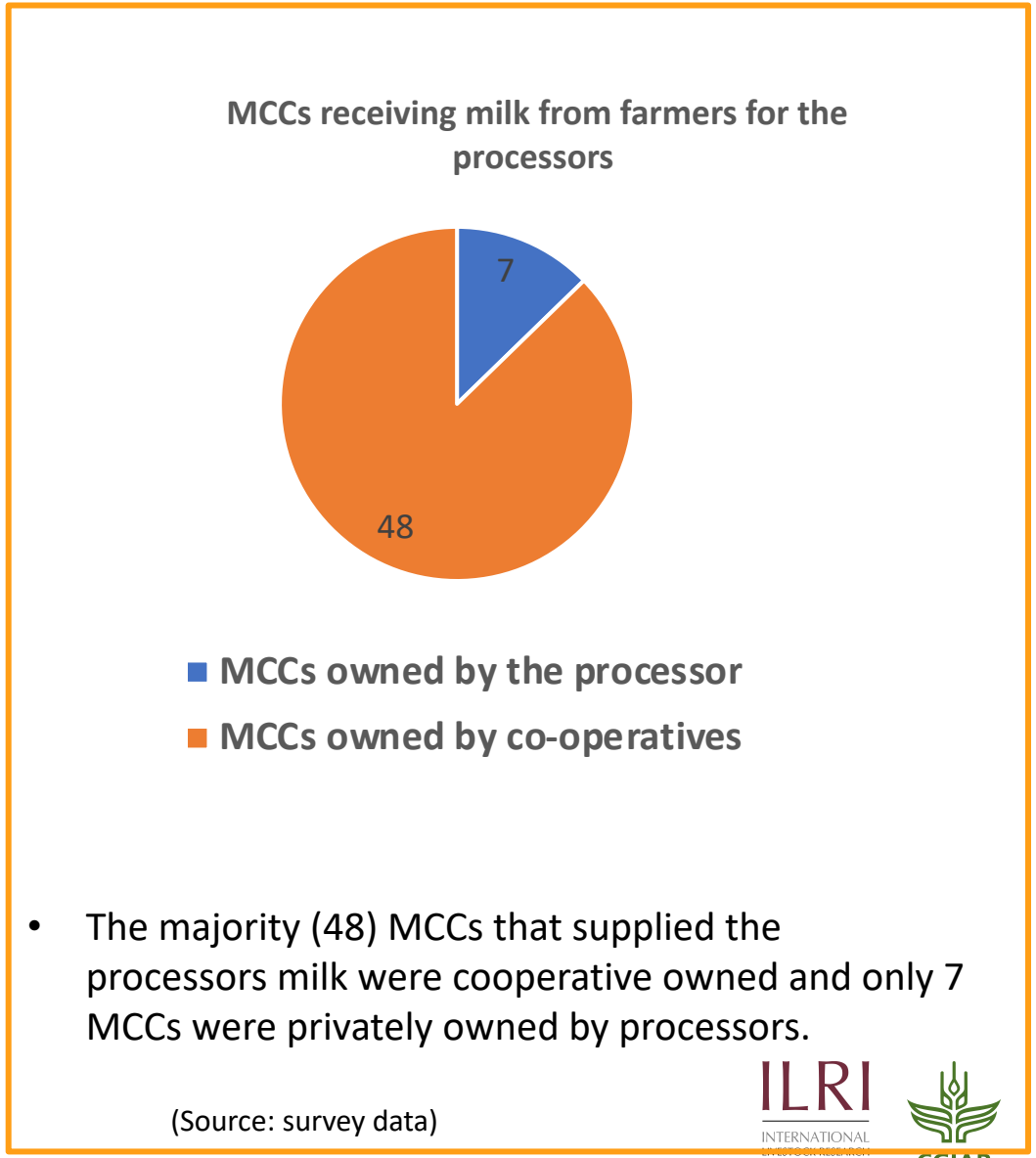
Milk collection, storage and bulking

- **547** registered Milk Collection Centers (MCCs)
  - Milk transportation from the farms to the MCCs is mostly by use of aluminum or stainless-steel cans tied on motorcycles or bicycles (mean total storage capacity of 6,718 liters)
  - The main tests carried out on the milk include alcohol (80% concentration), lactometer reading and observation
- After milk is bulked at bulking centers with a higher storage capacity than the MCCs
  - **12** bulking centers across the country with a total capacity of 266,560 liters
- Milk coolers have increased over time from **355** with a capacity of 1.5 million liters in 2016 to **645** in 2022 with a capacity of 2.08 million liters

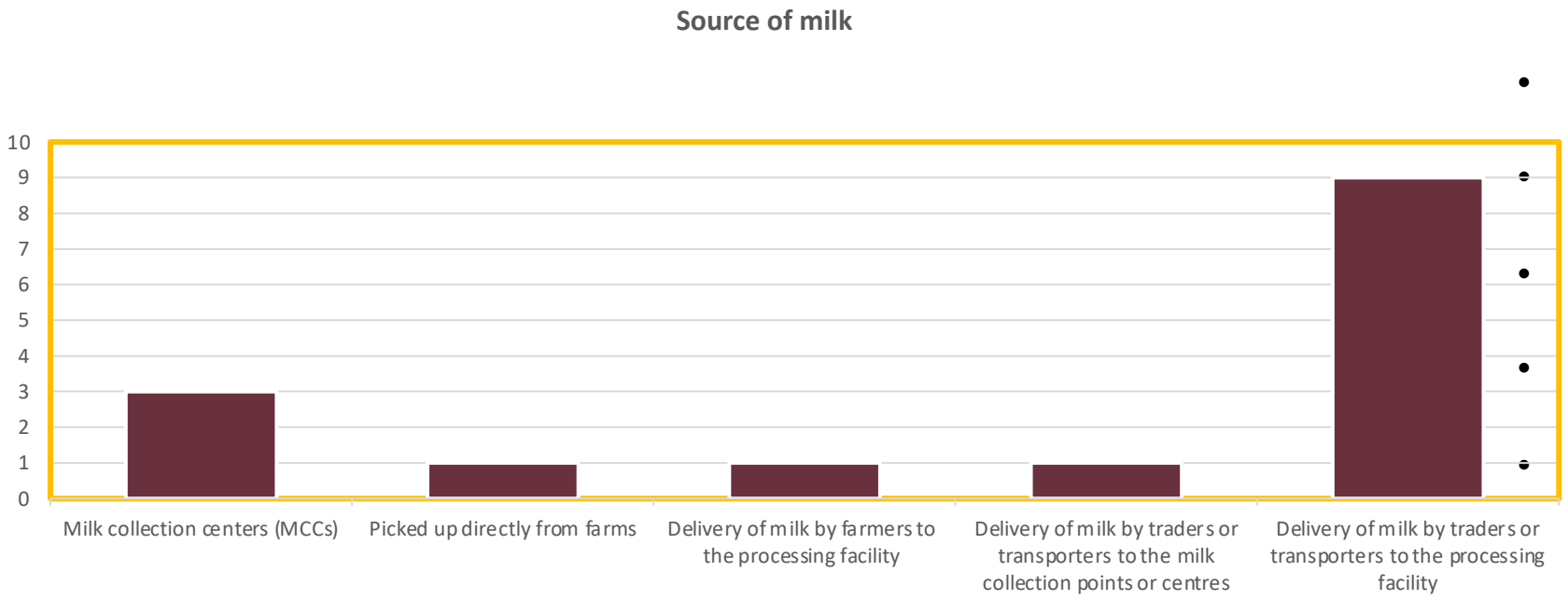


- The majority (48) MCCs that supplied the processors milk were cooperative owned and only 7 MCCs were privately owned by processors.

(Source: survey data)

Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

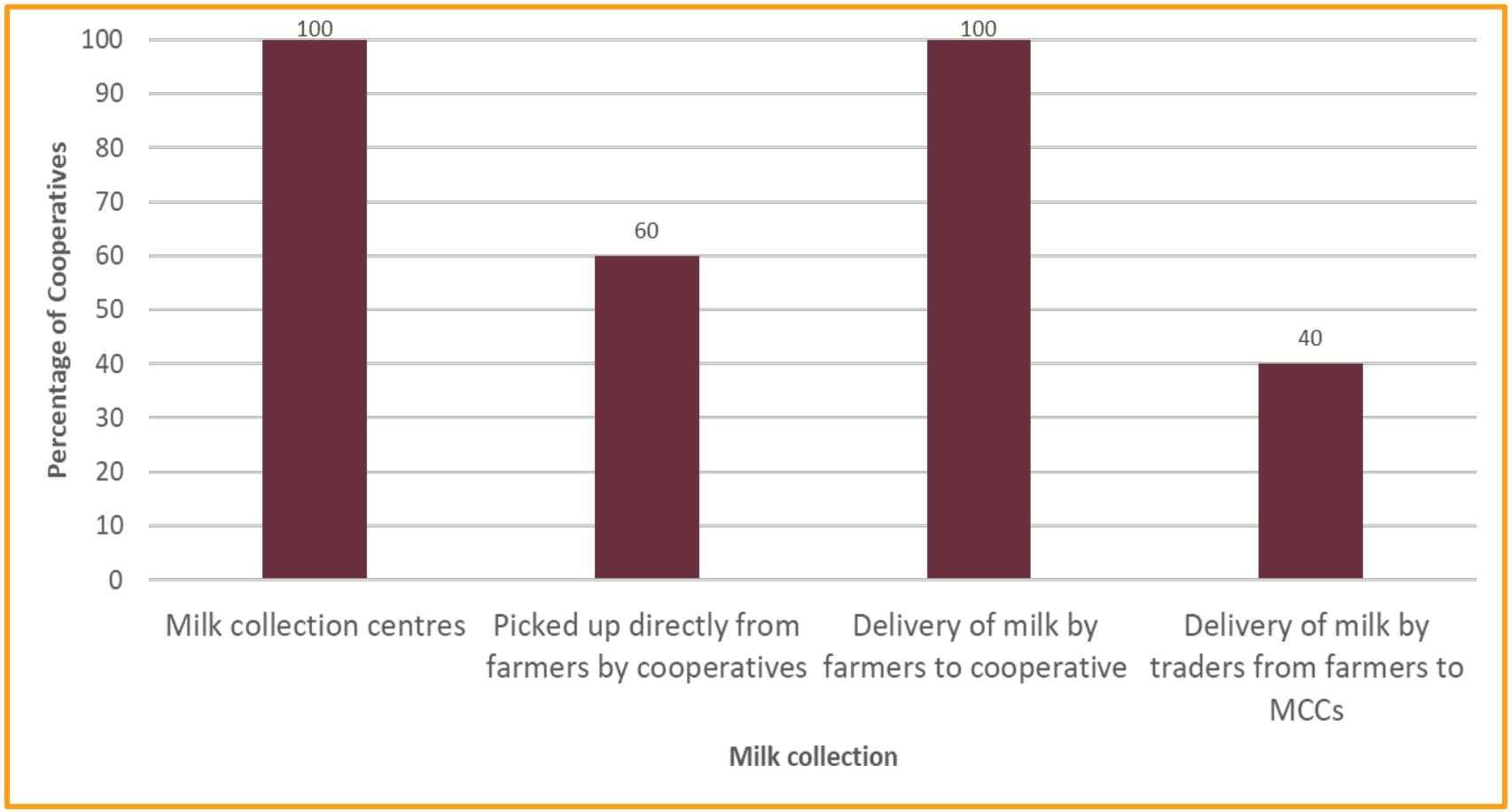
Proportion of processors and the various sources of milk



- Data is from 11 processors surveyed out of 145 processors operating in Uganda.
- 9 out of 11 processors sourced their milk from traders.
- 3 of the 11 processors source their milk from MCCs
- 1 processor picks up milk directly from farmers to MCCs.
- 1 processor mentions that milk is brought directly to their processing facility by farmers.

(Source: survey data (N=11)

Proportion of aggregators and how milk is collected from farmers



- Data is from 5 large cooperatives in Kiboga and Mbarara out of over 300 dairy cooperatives in the region surveyed.
- All cooperatives mainly collect milk at the cooperative Milk collection centers
- All cooperatives mentioned that farmers also deliver milk directly to the cooperative MCCs
- Some cooperatives pick milk from the farmers to the MCCs for those farmers that are not able to bring it directly.

(Source: survey data (N=5)

Milk collection, storage and bulking – Number of MCCS and coolers & installed capacity

Milk Shed	Number of MCCs	Percentage	Number of coolers	Installed capacity (liters)
South-Western	327	59.8	405	1,302,600
Central	104	19.0	122	443,186
Mid-West	48	8.8	48	149,000
Northeastern	33	6.0	34	92,500
Eastern	22	4.0	22	63,500
Northern	13	2.4	14	34.56
Total	**547**	100	**645**	**2,084,346**

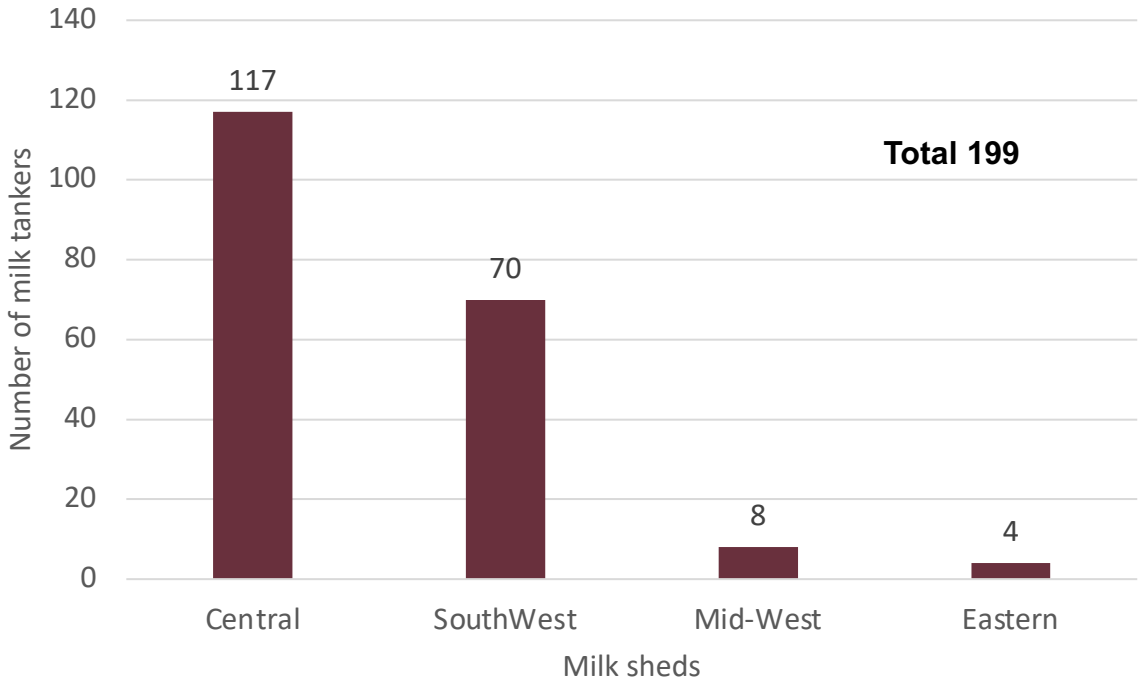
Western region is divided into southwestern and mid-west milk sheds: Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) (2022). Statistical abstract FY 2021/2022.

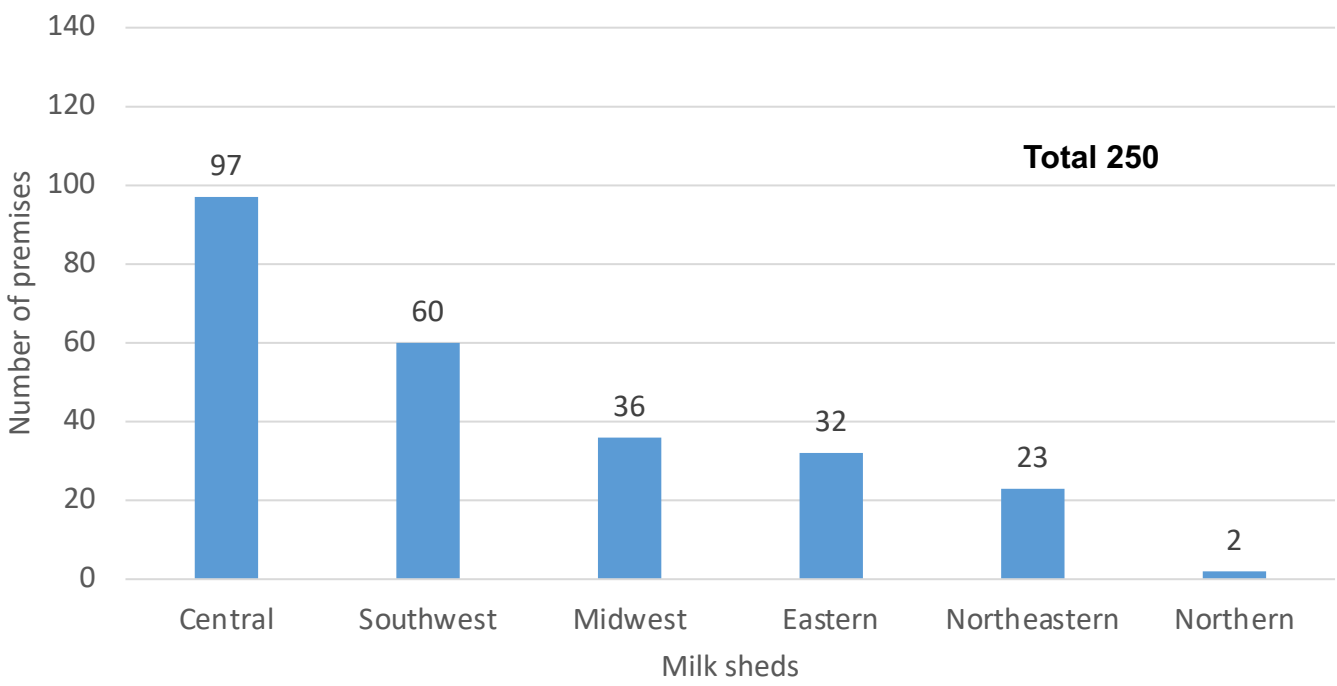
Installed and used capacity of coolers for surveyed aggregators

Cooperative MCC	Installed capacity (liters)	Used capacity (Wet season) liters/day	Used capacity (Dry season) liters/day
A (2 milk coolers)	10000	10000	5000
B (2 milk coolers)	3000	2800	1600
C (3 milk coolers)	13800	2500	1500
D (4 milk coolers)	25000	20000	7000
E (4 milk coolers)	38000	37000	20000

- The installed capacity is a total of all the milk coolers owned by the cooperatives.
- The used capacity per day for all the 5 cooperatives surveyed is lower than the installed capacity in the dry season.
- Some cooperatives still operate less than their installed capacity in the wet season.

Distribution of registered milk tankers and freezer facilities by milk shed





Western region is divided into southwestern and mid-west milk sheds: Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

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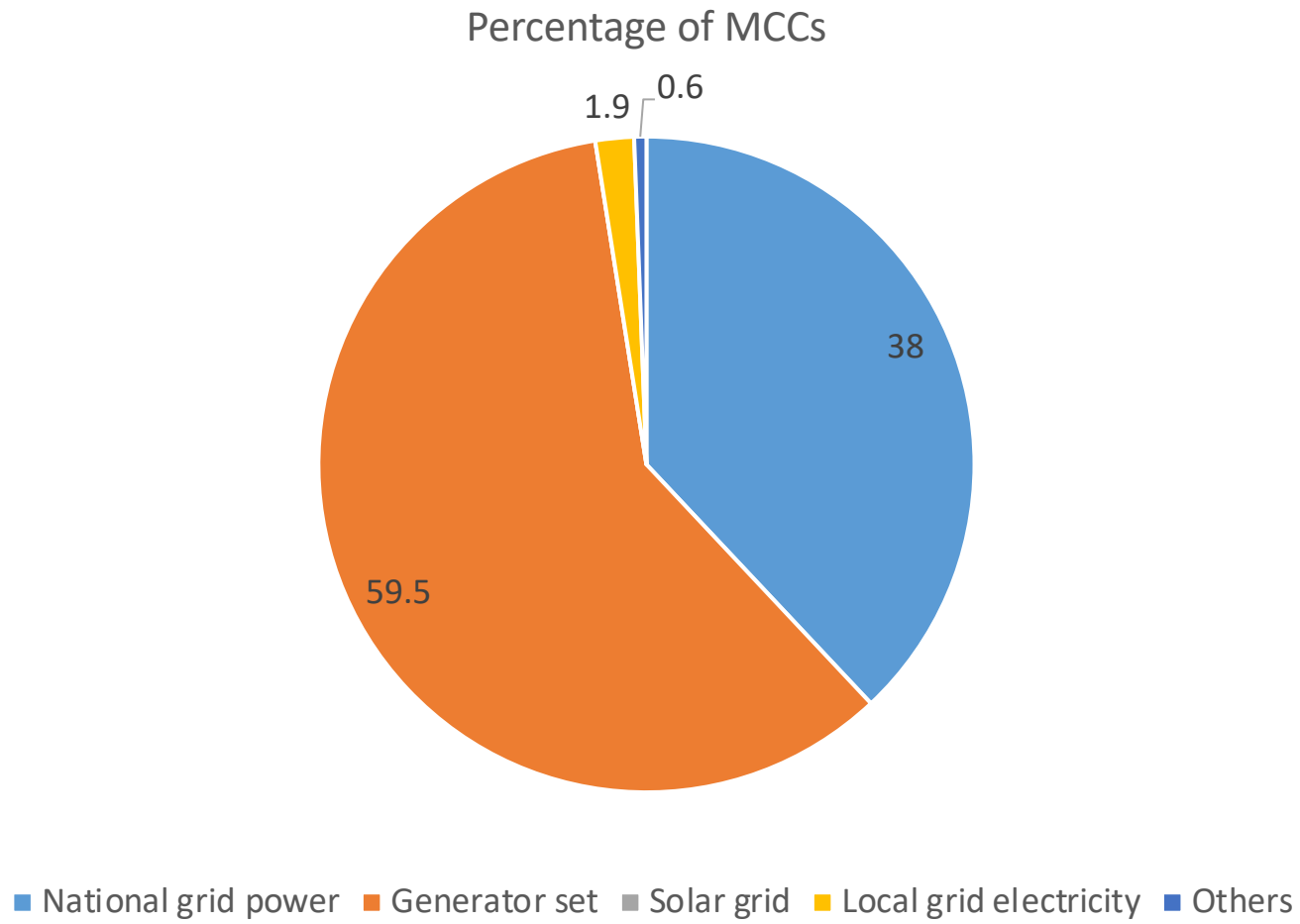
Key challenges faced by MCCs

- Inability to receive adequate volumes of milk leading to low capacity-utilization of milk-cooling equipment, particularly in the dry season
  - Low productivity of animals due to a forage shortage and water particularly in the dry season, and utilization of low-performing dairy breeds
  - Small number of milk producers in the area either due to a shortage of land for livestock farming or the existence of alternative and better sources of livelihood
  - Animal health constraints, e.g., foot-and-mouth disease, East Coast fever and tick acaricide resistance
- High operating costs
  - High energy tariffs, particularly grid power and diesel
  - High cost of transport, labor and other services
  - Possible prohibitive statutory requirements such as the collection of a withholding tax from the milk producers
- Bottlenecks in the dairy value chain (such as access to clean water, waste-disposal facilities, reliable and affordable energy)
- Post-harvest losses that result from failure to access the market throughout the year

Source: Dairy Deelopment Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022. Dairy Development Authority (DDA). (2022). DAIRY POLICY ACTION PLAN | Enhancing the Performance of Uganda's Dairy Value Chain.

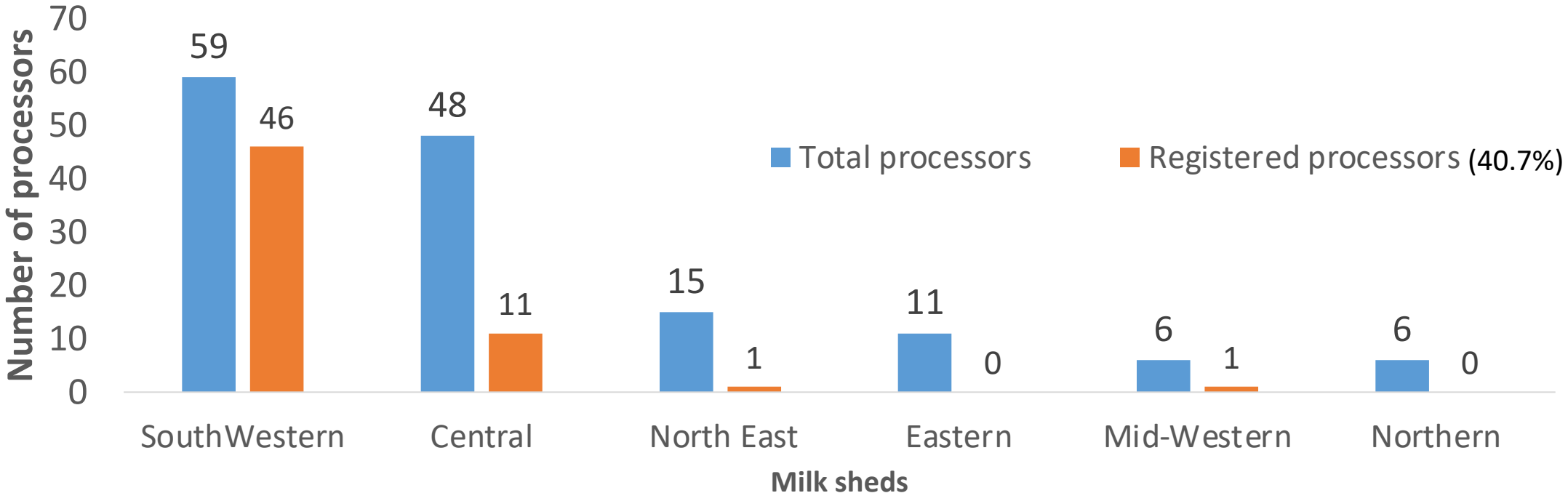
Energy and water sources used by MCC (Literature)



- 59.5% of MCCs are relying on diesel generators as their primary energy source due to frequent power interruptions (averaging 2.7 times per week).
- Supply of grid power is not reliable, coverage is still low, and the tariffs are high
- None of the MCCs utilize renewable energy sources such as solar or biogas for chilling milk
- Only 44% of the MCCs have access to piped water, and as high as 79.6% of MCCs must purchase the water they use. The inability to access affordable clean water hampers thorough cleaning of milk coolers and accessories in the MCCs

(Source: Balikowa, D., Otikal,K. & Mpiira, A.S. (2021). Performance of milk collection centers in Uganda. "Facilitating evidence-based policy dialogue on performance of the dairy value chain".)

Distribution of processing facilities by registration status per milk shed



- There is a total of 145 processors but only 59 are registered and licensed by DDA.
- Registration of dairy processors is important to ensure that they adhere to the recommended standards and for closer supervision and inspection

Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

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Installed and operating processing capacities per milk shed

Milk shed	Installed capacity (Litres)	Operating capacity (Litres)
Southwestern	2,107,910	1,431,430
Central	1,252,470	878,240
Midwest	1,100	900
Northeast	4,665	3,360
Northern	10,900	5,350
Eastern	1,900	1,500
Total	**3,378,945**	**2,320,780**

- The total national operating capacity is **2.3 million litres** against the installed capacity of **3.4 million litres** representing **68.7%**
- Low operating capacity is caused partially by inconsistent milk quality and supply
- Majority of the processing plants are in the southwestern and central milk sheds accounting for **62.5%** and **37.1%** of the installed capacity, respectively.
- The western region is divided into two milk sheds (southwestern and midwest)

Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

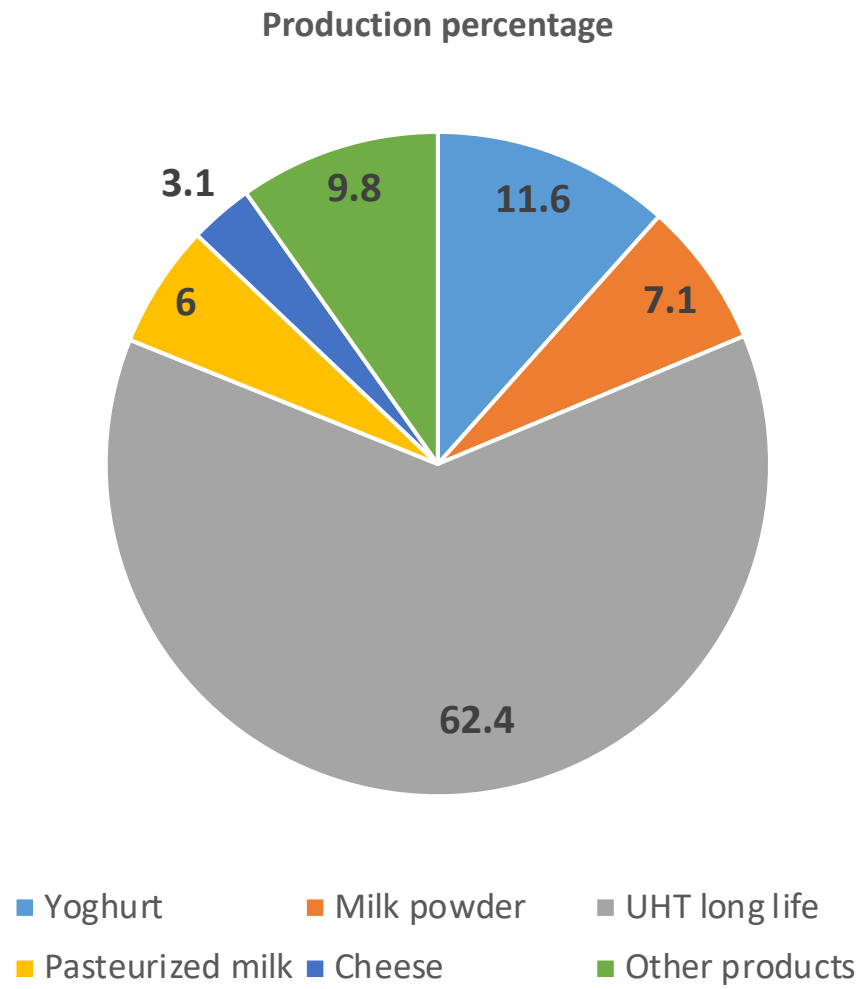
Distribution of small-scale DDA-approved milk cottage businesses per milk shed

Milk shed	Number of cottages inspected and registered
Southwestern	35
Central	54
Midwest	8
Northeast	15
Northern	13
Eastern	1
Total	**126**

- Growing cottages **(home back yard processors)** needing constant inspection to ensure compliance
- A total of **126** cottages have been approved for compliance with the dairy standards
- Majority of them are in the **central and southwestern milk sheds** representing 42.9% and 27.8% respectively
- Mainly process **yoghurt, ice cream and cheese.**

Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

Processed dairy products in Uganda



- A variety of dairy products are processed for both local and international consumption
- UHT milk accounts for highest proportion (62.4%) of all processed products, followed by yoghurt (11.6%) and milk powder (7.1%)
- Other products include; Acid casein, Ghee, ice cream, butter ,whey protein etc.

Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

Average ex-factory prices of Milk and Dairy products

Product name	Average ex-factory price(Ugx/kg)
Yoghurt	4,386
Full cream milk powder	16,900
UHT long life	2,735
Pasteurized milk	2,200
Cheese	23,711
Butter	11,478
Ghee	13,794
Casein	23,582

- Ex-factory prices differ from one processor to another and from one season to another due to the different costs of production associated with each processor.
- The ex-factory price is also dependent on the type of materials required to process the product.
- The retail prices are higher than the ex-factory prices for these processed products.
- **Cheese** is the most expensive product priced at the factory and the least is **pasteurized milk**.

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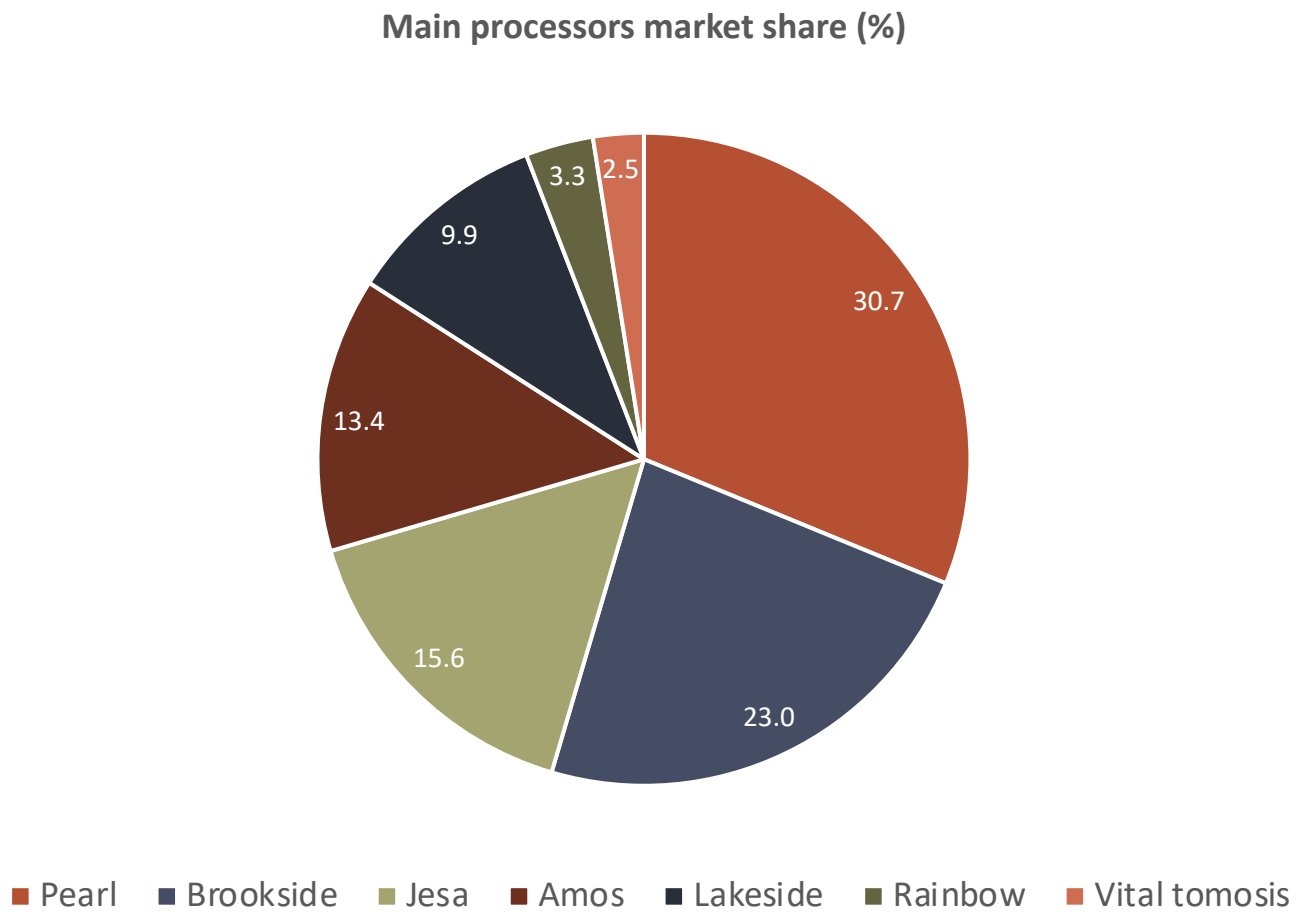
Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.

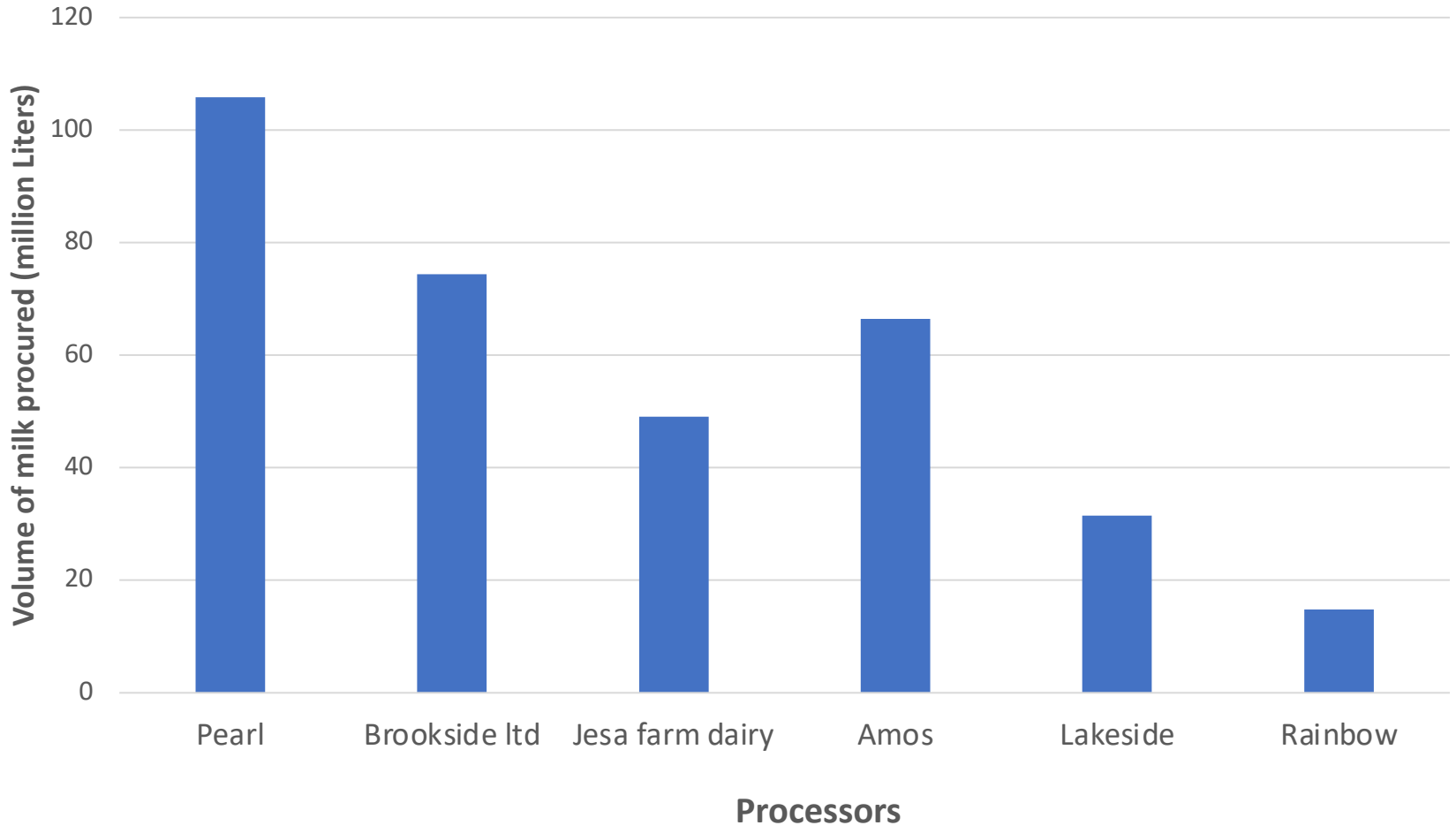
Market share of top processors by product value



- Currently the market is dominated by a few large processors, and data from DDA indicates that the top 4 dairy processors hold 83% of the total market share.
- Pearl Dairies has the highest market share (31%), followed by Brookside Dairy Ltd (23%), Jesa farm (16%) and Amos Dairies (13%).

(Source: DDA,2023)

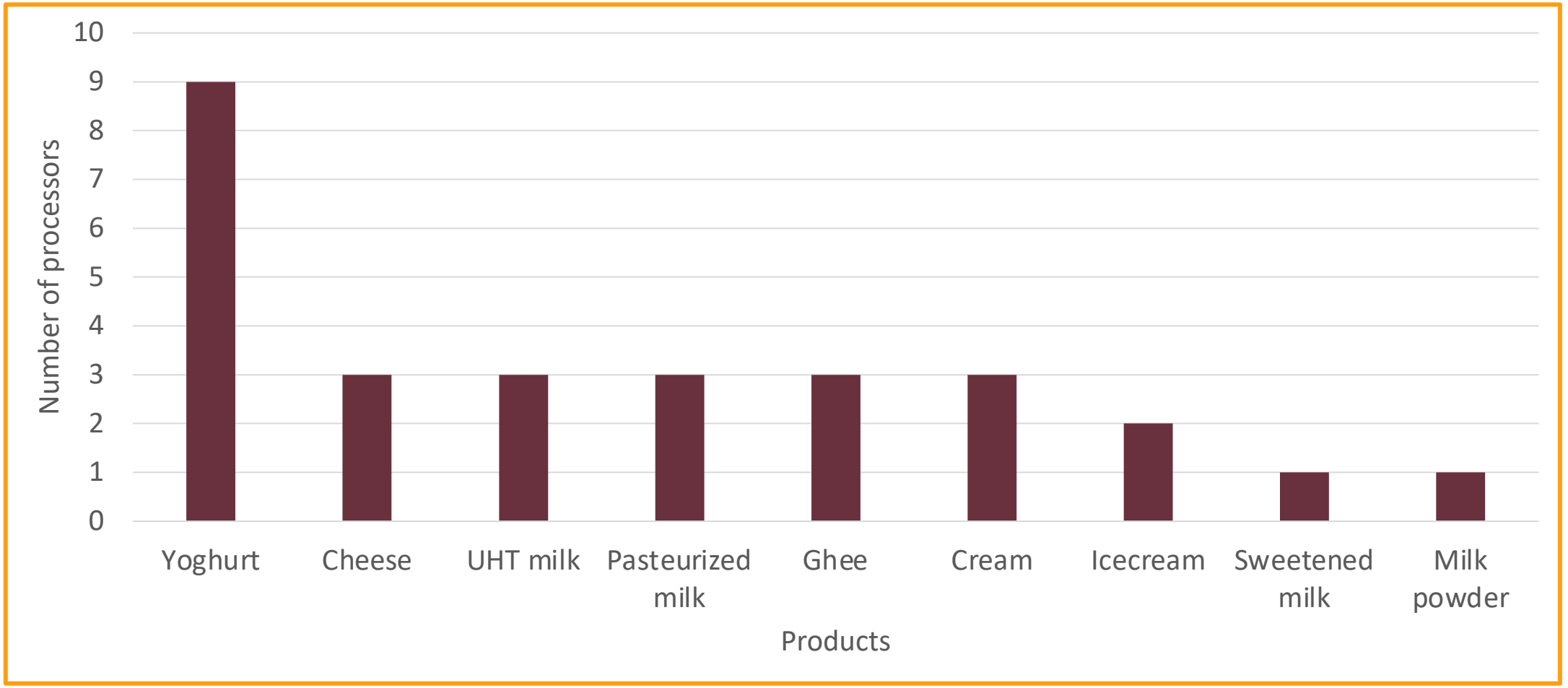
Market share of raw milk procured by top processors



- Pearl Dairies Ltd procures the highest number of liters of raw milk. This is followed by Brookside Dairies Ltd then Amos Dairies.
- Jesa farm Dairy procures less milk, yet their market share is high. This is because they own a farm and supplement the milk from the farm with milk procured.

(Source: DDA,2023)

Types of dairy products produced (surveyed processors)



- Out of 11 surveyed processors, 9 of them produce yoghurt
- About three processors specialise in at least one type of dairy product
- Only one processor is producing milk powder and sweetened milk
- While two processors produce ice cream

(Source: Survey data)

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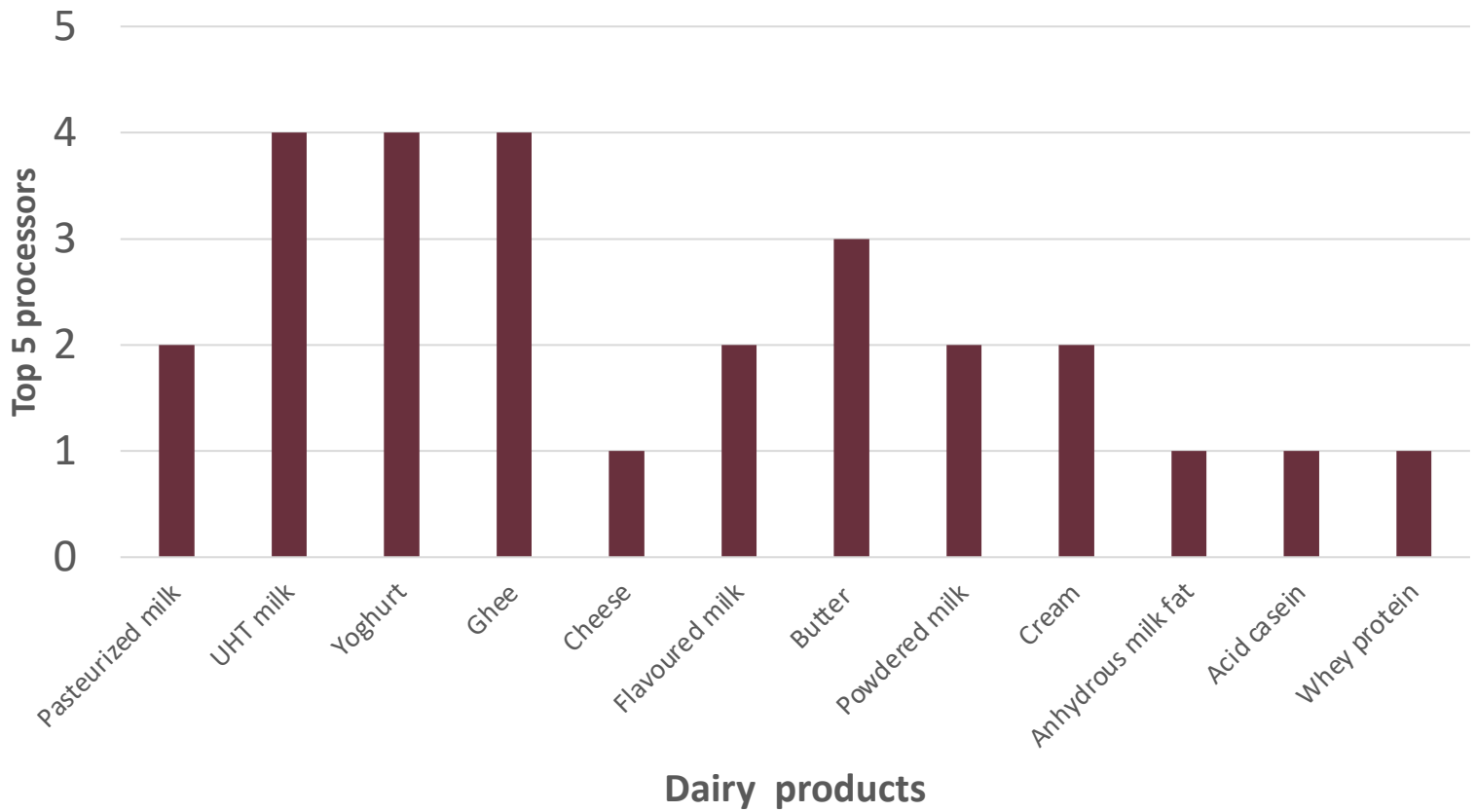
Dairy products processed by the top 5 processors in Uganda



- The top 5 processors are those who have the largest market share in the dairy sector.
- 4 processors process mainly UHT milk, yoghurt and Ghee.
- 3 of the processors process butter.
- One processor processes anhydrous milk fat, acid casein and whey protein which is all exported.

(Source: companies' websites)

SWOT analysis of milk processors in Uganda

Strength	Weaknesses
• Government commitment to agro processing • Increased number of processors • Growth of the cottage industry • Existence of processors association • Improved access to machinery for milk processing • Existence of enabling regulatory and legal framework (DDA and UNBS) • Improved shelf life of milk products	• High competition from the informal market • Weak enforcement of laws and regulations • Limited rural distribution channels • Low staffing of dairy experts • Policy gaps • Adulteration/contamination of milk
Opportunities	**Threats**
• Increased milk production • Growing industrial linkages • Steadily growing demand for the products (local, regional, and international) • Ability to reach far markets • Untapped market in some regions	• Competition from imports • VAT on imported packaging materials • Counterfeit products • Non-tariff barriers • Seasonal fluctuations in milk supply • High costs of production e.g., power • High cost of machinery and financing • Inflation and exchange rate fluctuation • Low milk product consumption • Competition from the informal market • Competition from other substitutes • Milk adulteration/contamination

Source: Dairy Development Authority (DDA), Strategic plan II FY 2020/2021 – 2024/2025.

Those highlighted in red were mentioned during our field survey

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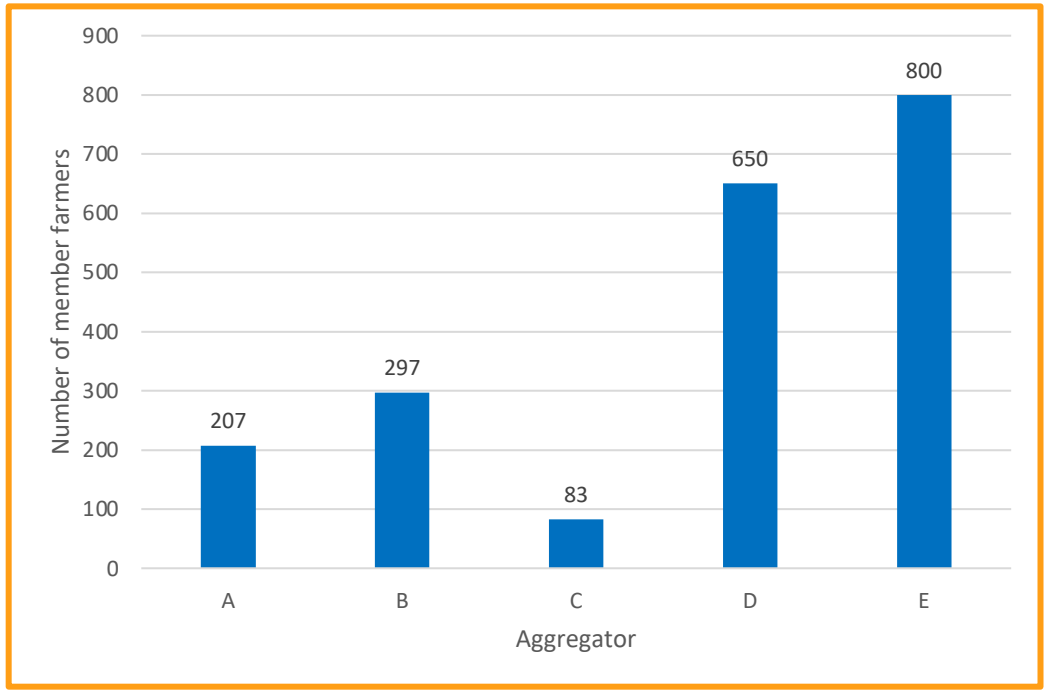
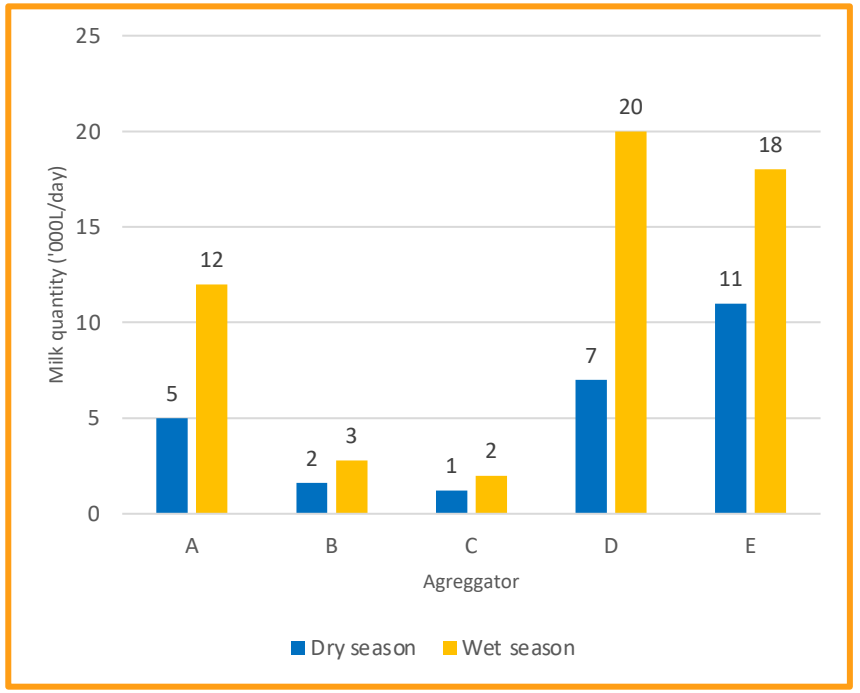
Dairy Cooperatives: membership and quantities of milk collected





- Amounts of milk drops drastically during the dry season due to scarcity of water and feed for the cows
- From the farmers that supply milk to cooperatives, on average, 84% are male farmers and 16% are female.

(Source: Survey data)

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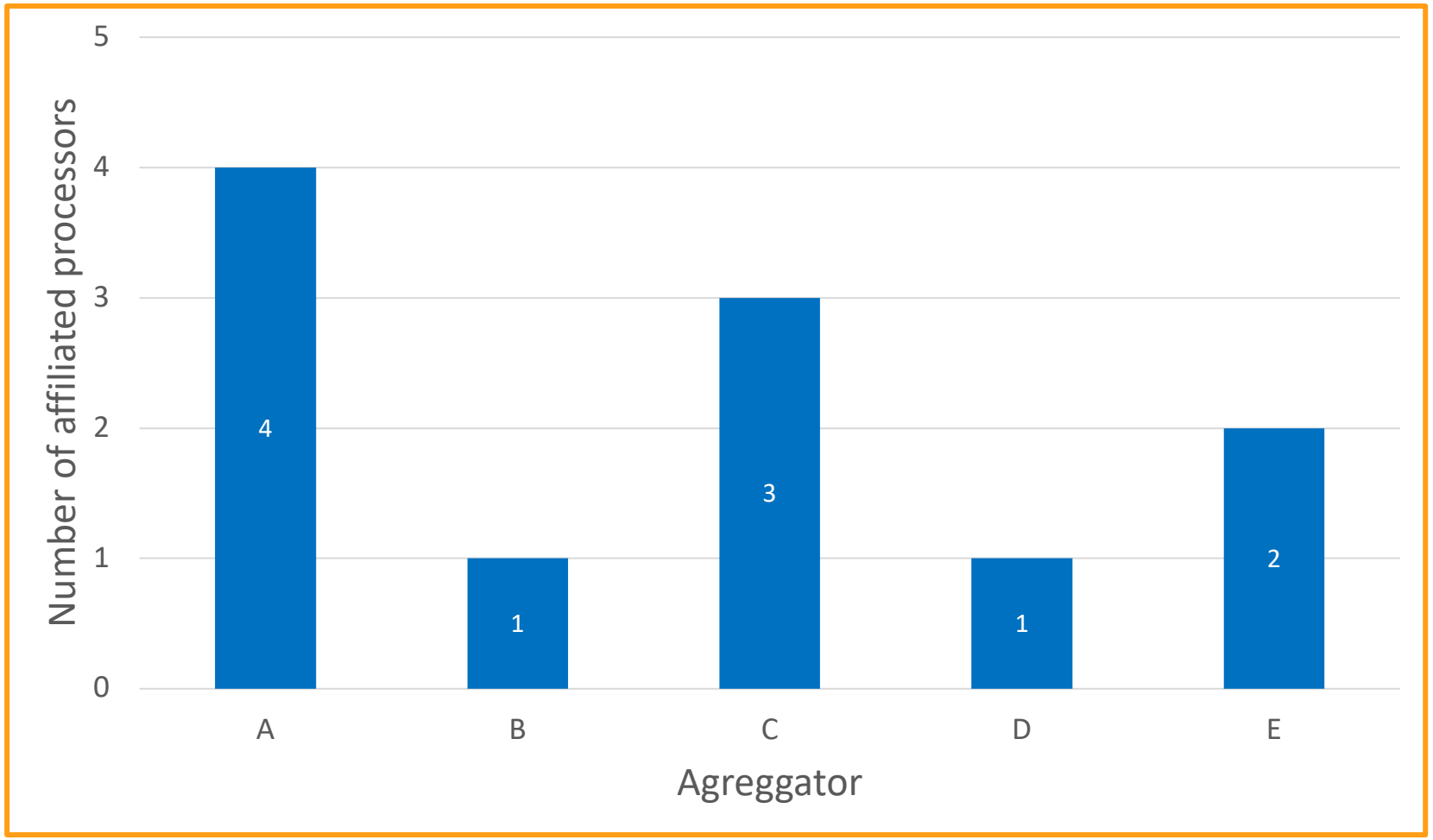
Affiliated processors to cooperatives (Survey findings)



- The common processors that the cooperatives were affiliated to were Pearl Dairies Ltd (by 3 aggregators) and Jesa Farms Ltd (by 2 cooperatives).
- Other mentioned processors were Lakeside Dairy Ltd, GBK dairy Ltd, Amos Dairy Ltd, Paramount Ltd, Sanatos food factory and Rainbow Dairy Uganda Ltd.
- Cooperative E sells their milk to Jesa farm Dairy because they pay well. They give a good premium price for quality milk.
- Cooperative A supplies to 4 processors for diversification purposes.

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Summary of annual post-harvest milk losses at different dairy value chain nodes, as percentage of volume

Stage	Value chain node	Causes for milk losses	Annual post-harvest loss (% of volume)
1	Farm level	Poor timely linkages to markets	0.96%
2	Milk collection	Milk rejected, due to low quality (e.g. use of plastic milk cans) or other reasons (e.g. adulteration)	13.60%
3	Milk bulking	Milk rejected, due to aggregation and limited milk testing before bulking	7.09%
4	Bulk transport	Milk spillage, milk contamination	0.86%
5	Processing plants (medium size)	Milk spillage, milk contamination	2.01%
6	Processing plants (large)	Milk spillage, milk contamination	0.20%

Source: Dairy Development Authority (DDA). (2022). DAIRY POLICY ACTION PLAN | Enhancing the Performance of Uganda's Dairy Value Chain.

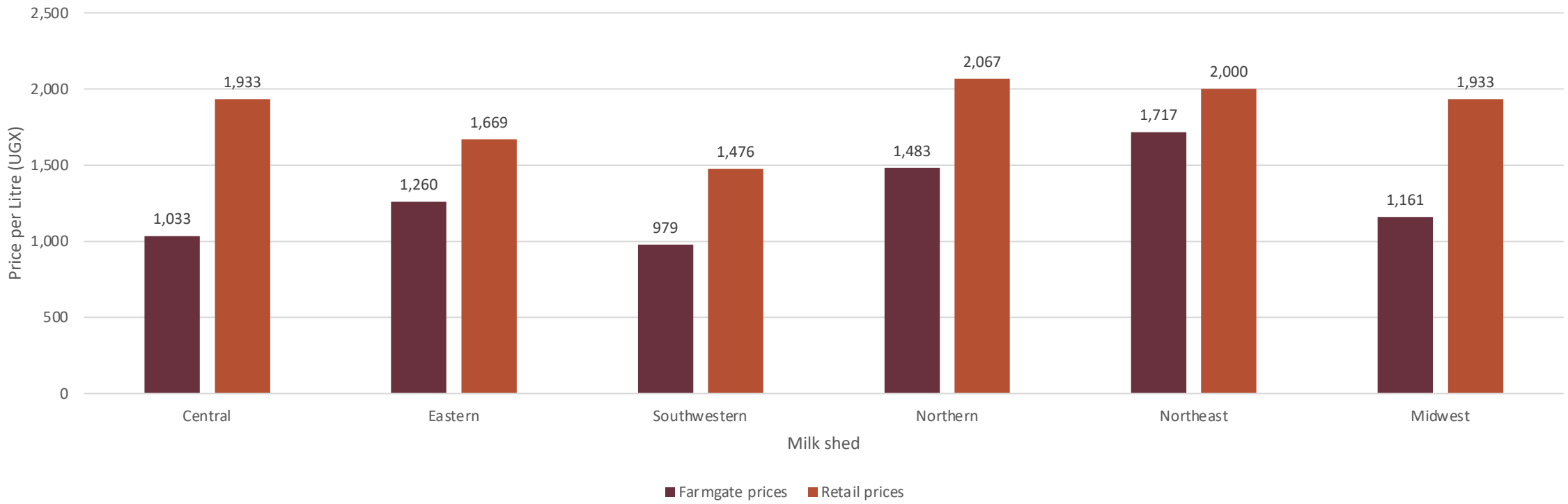
Standard for quality raw milk set by DDA

Parameter	US EAS 67:2019 Raw milk specification
Added water,%	0.0
Freezing point, *degrees Celsius*	-0.525 - 0.550
Density, g/ml (20 *degrees Celsius*)	1.028 - 1.034
SNF,%	Min 8.5
Fat,%	Min 3.25
Formalin (LoD;0.005ppm)	Absent
Neutralizers (LoD; 0.05%)	Absent
Alcohol,75%,v/v	Negative

- These specifications are what DDA has set for good quality raw milk.
- Milk is poor quality if it does not meet these specifications
- However, different processors have different specifications (although following the ones set by DDA) depending on the products that they are going to process.
- The cooperatives follow the specifications set by the affiliated processors.

(Source: DDA)

Milk shed raw milk prices (January–March FY 2022/2023)

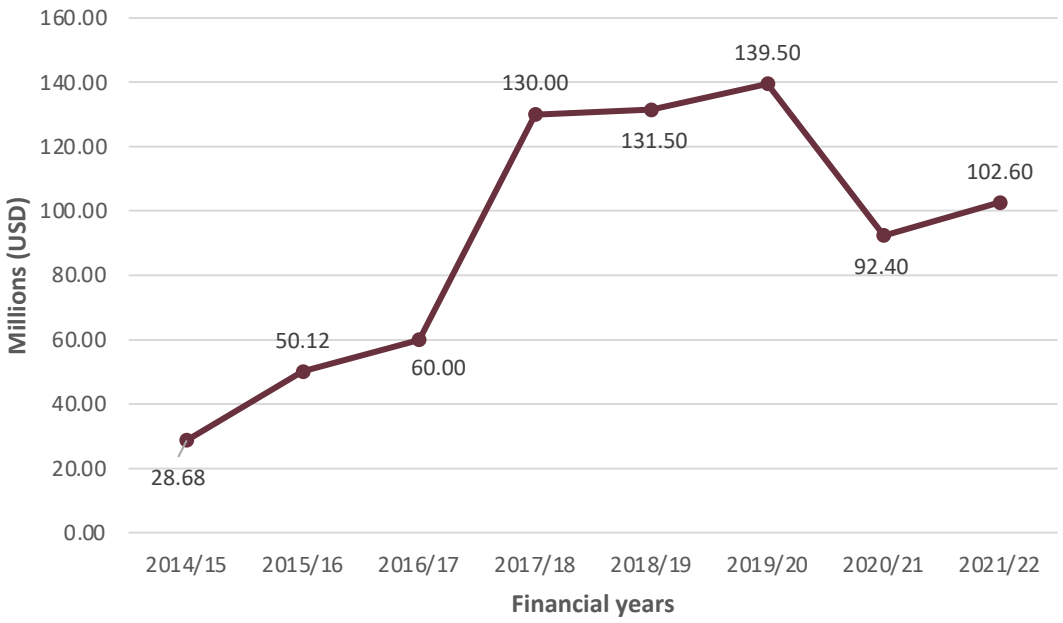


- Farm gate prices are higher in the Northern and Northeastern milksheds because the supply of milk is low in these areas
- Farm gate prices are lower in Southwestern milkshed because of surplus in milk production
- Retail prices are higher in Northern and Northeastern milksheds because they are milk deficit regions.

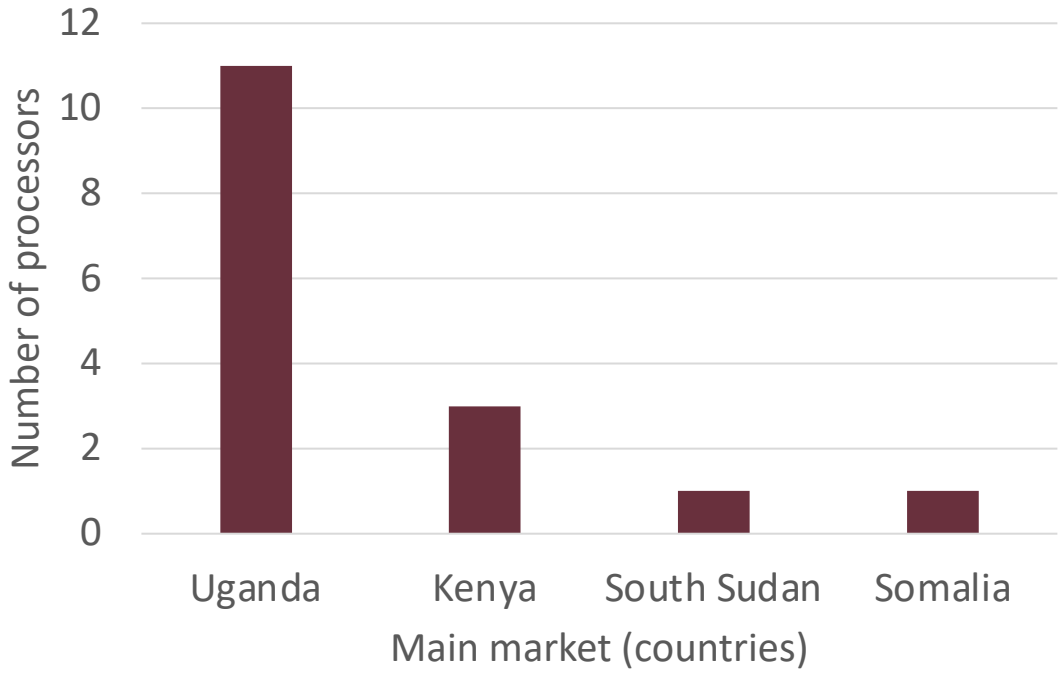
Source: Dairy Development Authority (DDA). (2023). Quarter III, Statistical brief. January – March 2023. FY 2022 /2023.

Trend of dairy exports and markets in Uganda

Trend of dairy exports over the last eight years in Uganda (value)



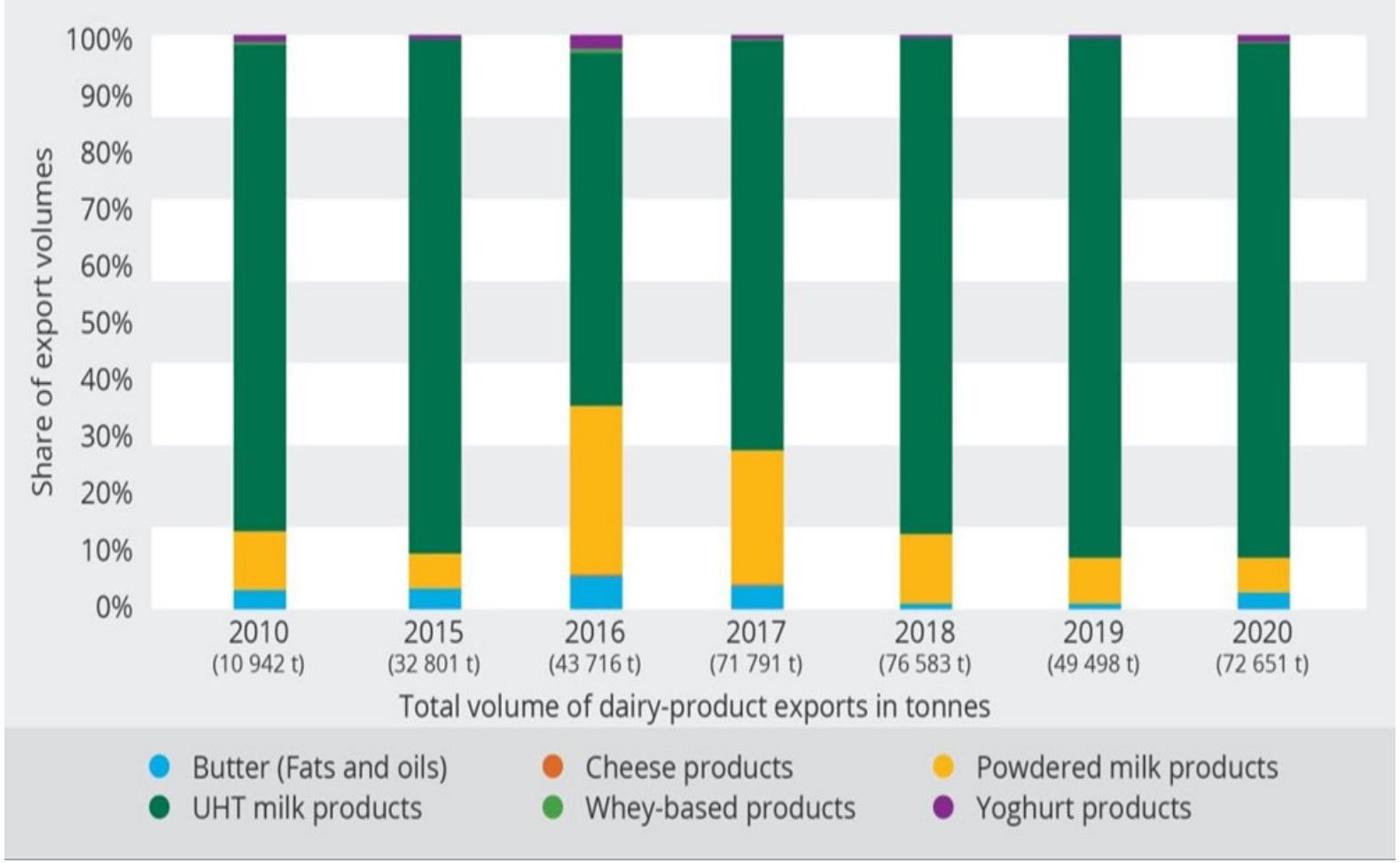
Main milk markets for processors in Uganda



- Dairy exports account for 8% of the total export value
- Uganda exports dairy product to 16 countries e.g., Kenya, South Sudan, Somalia, USA, Oman, etc. Main products are UHT milk, milk powder, butter, cheese, yoghurt, & acid casein
- Export of powdered milk to Algeria starting October 2023

Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). (2022). Statistical abstract FY 2021/2022.; Survey data

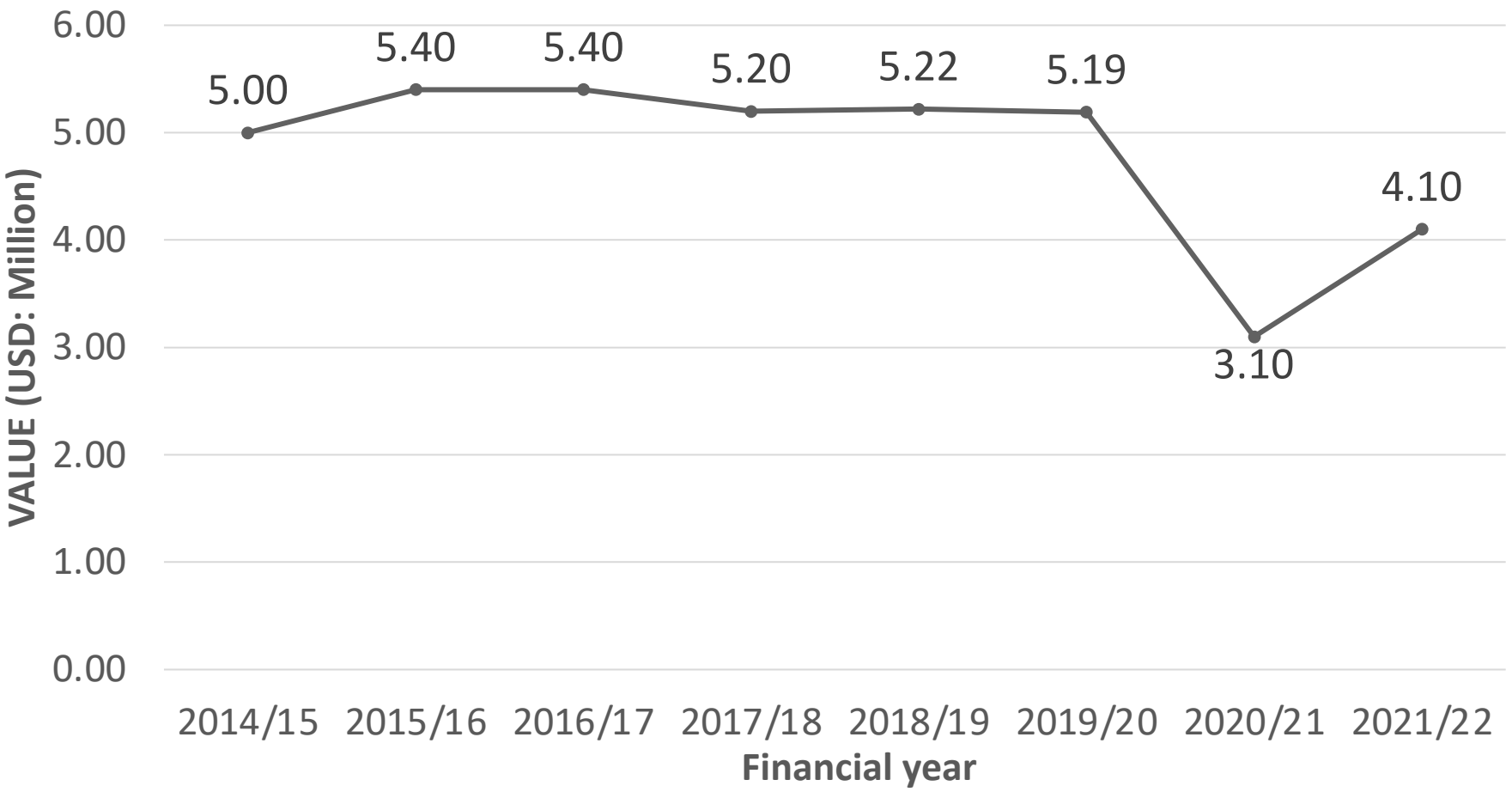
Dairy products exported (2010 to 2020)



- The main exported dairy product is UHT milk. This is shown in all the years.
- Powdered milk is the second most dairy product exported followed by butter.

(Source: URA. 2021,*Exports and imports data)*

Trend of dairy imports in Uganda



- Trend of dairy imports has been decreasing overtime due to increased domestic processing
- Uganda imported several dairy products from a total of 36 countries e.g., Rwanda, Kenya, Netherland, Poland, UAE etc.
- The main products imported included infant formula, ice cream, milk powder, yoghurt & cheese

Source: Dairy Development Authority (DDA). (2023). Quarter III, Statistical brief. January – March 2023. FY 2022/2023.

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Cost breakdown for milk production per liter at farm level

	Industry average cost (UGX) for milk production per litre	
Item	**Wet season**	**Dry season**
Labour	89.2	136
Feeding	222.7	290.4
Water	5.4	112
Animal health	78.6	142.7
Breeding	8.6	11.4
Transport	5.7	9.3
Extension	42.4	44.9
Total cost/litre	**452.6**	**751**
Farm gate price	**900**	**1100**
Net profit	447.4	349

- Costs differ according to the production system.
- Using the industry average, the costs of milk production differ in the wet and dry season.
- The costs are higher in the dry season compared to the wet season. This is attributed to scarcity of water and feeds for the animals. Labor costs are high in the dry season too.
- The farm gate prices are slightly higher in the dry season compared to the wet season.

Cost breakdown for processing a liter of pasteurized milk, UHT milk and a Kg of powdered milk

		Industry average costs (Ugx)	
Item	**Pasteurized milk**	**UHT milk**	**whole cream milk powder**
Cost of warm milk at the MCC/liter	883.33	883.33	883.33
Cost of chilling milk at the MCC/liter	102.5	102.5	102.5
Cost of transporting a liter of milk	60.33	60.33	60.33
Total costs chilling + Transport/ Liter	**1,046.16**	**1,046.16**	**1046.16**
Total costs chilling + Transport			**8,892.36**
Cost of processing/liter	831.7	831.7	240
Cost of packaging/liter	68.6	491.7	37.4
Total costs processing/ Liter	**900.3**	**1,323.40**	**277.4**
Total costs processing/ Kg			**2,357.90**
Total cost of production/liter or Kg	**1,946.46**	**2,369.56**	**11,250.26**
Ex factory price/liter	**2,200**	**2,735.30**	**16,900**
Estimated profit/liter/Kg	254	366.00	5,649.74
	Export costs		
Cost of exporting to EAC (Kampala-Mombasa)/Liter		$0.15	
Cost of exporting a Kg to EAC (Kampala-Mombasa)			$0.08
Cost of exporting a Kg to UAE (Kampala- Dubai)			$0.11
Cost of exporting a Kg to Asia (Kampala- Japan)			$0.14
Price of powder on world market/Kg			$3.21

- The costs of processing powdered milk is higher compared to pasteurized and UHT milk and so is the price per Kg.
- There are high costs of packaging incurred in processing UHT milk. This is because the packaging material is not produced locally and is also subjected to taxation (25%) on importation.
- The price of UHT milk and pasteurized milk is twice the price of raw milk. Powdered milk is 17 times higher than the price of raw milk.

(Source: DDA)

Milk consumption in Uganda

- Milk per capita consumption in Uganda has significantly improved in past years
- Consumption increased from **60L** in 2015 to about **63.8L** in 2019; but consumption is still lower than the annual recommended amount of by WHO of 200L per person.
- Most of the milk consumed especially in rural areas is in raw form, however, the dairy products mainly consumed in urban areas are of pasteurized milk, UHT, yoghurt and other products. Purchase of raw milk from outlets is also common.
- The Government's target is to have each person consuming at least 200L of milk annually through various s awareness campaigns e.g., **School Milk Program** and **World's June dairy month** etc.

Source: Dairy Development Authority (DDA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) . (2022). Statistical abstract FY 2021/2022.; Dairy Development Authority (DDA). (2022). DAIRY POLICY ACTION PLAN | Enhancing the Performance of Uganda's Dairy Value Chain.; Richard M. Ariong & Kenneth Otikal, (2022). Milk consumption in Uganda. DDA

Factors favoring consumption of raw milk compared to processed milk

- Consumers have a negative attitude towards pasteurized milk (they think the milk has chemicals in it and some nutrients have been removed)
- Processed milk is expensive compared to raw milk. In the wet season, pasteurized milk is 3000Ug shs/liter and raw milk is 1,500 Ug shs/liter. In dry season, 4000 Ug shs/liter and raw milk is 2,000 Ug shs/liter.
- Limited access to processed milk especially in rural areas due to the absence major supermarkets outlets with cold chain facilities/infrastructure needed for milk marketing.
- Raw milk is marketed on door-to-door system and pasteurized milk is placed in supermarkets. Raw milk has the power of marketing compared to processed milk. The door-to-door system works for low-income earners.
- Raw milk can be given to consumers on credit as there is a personal relationship between consumers and traders which is not the case for processed milk. Supermarkets cannot give pasteurized milk on credit to consumers.
- Weak milk consumption campaigns for processed milk.

(Source: Key Informant Interviews)

The pilot School Milk Program (SMP)

- The School Milk Program started in 2016 by SNV in South-western Uganda (Bushenyi, Isingiro, Kiruhura, Mbarara, Ntungamo and Sheema districts) as a national pilot
- It was a parent-led school feeding program on cost sharing basis
- It was an initiative of the SNV's The Inclusive Dairy Enterprise Project (TIDE) project funded through the Embassy of The Netherlands
- From an initial target of 5,000 children, the SMP was adopted by 942 schools with about 320,000 school children receiving milk mixed with porridge. Over 27,000L of milk was supplied daily
- 59 nursery schools with 6,000 children embraced drinking yoghurt twice a week. The yoghurt was supplied by women's groups

Sources: https://www.monitor.co.ug/uganda/news/national/government-revives-mandatory-milk-plan-for-schools-4268042 (June 2023); https://www.newvision.co.ug/category/news/govt-urges-parents-to-feed-children-milk-at-s-142731; Case study consumer strategies: The Inclusive Dairy Enterprise - phase II (TIDEII).; SNV. (2022). Deepening and Scaling-up Dairy Sector Transformation. TIDE factsheet.

The current School Milk Program (SMP)

- This was a continuation of pilot phase of SMP through SNV's TIDE-II project that started in 2020 and ends 2023. Funded by the Dutch Government.
- An advanced version of the school feeding program started with a target to add 500,000 children from 610 schools within Kampala.
- Parent-led school milk project/Yoba for Life was extended to 14 districts from the original 7 in TIDE-1
- Processor-led school milk pilot project in 3 districts in Kampala Metropolitan
- Three strategies are being looked at by the government; Parent-led within private institutions, government-led within government-aided schools and in between, processors give a special package at a subsidised rate
- Members include FAO, UN food agency, SNV and milk processors (Amos Dairy Ltd, Pearl Dairy farms Ltd, Brookside and JESA farm Dairy Ltd)

Sources; SNV. (2022). Case study consumer strategies: The Inclusive Dairy Enterprise - phase II (TIDEII). SNV. (2022). Deepening and Scaling-up Dairy Sector Transformation. TIDE factsheet.

SWOT Analysis of milk consumers in Uganda

Strength	Weaknesses
• Enabling legal framework on consumer protection	• Inadequate promotion of milk consumption • Weak enforcement of the laws • Lack of reliable market information • Knowledge gap on consumer protection rights and dietary values. • Poor surveillance • Negative consumer perceptions about drinking milk
Opportunities	**Threats**
• Milk consumption campaigns • Wide range of dairy products including for use in local cuisines • Feedback from consumers • Better distribution	• Adulteration of milk • Counterfeit dairy products • Policy changes • Irregular supply of milk • High prices of processed dairy products • Competition from other substitutes

Source: Dairy Development Authority (DDA), Strategic plan II FY 2020/2021 – 2024/2025.

Those highlighted in red were mentioned during our field survey

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Agenda

- Dairy sector overview
- **Productivity & climate solutions**
- Supporting enterprises
- Access to finance
- Government's role in enabling sector transformation

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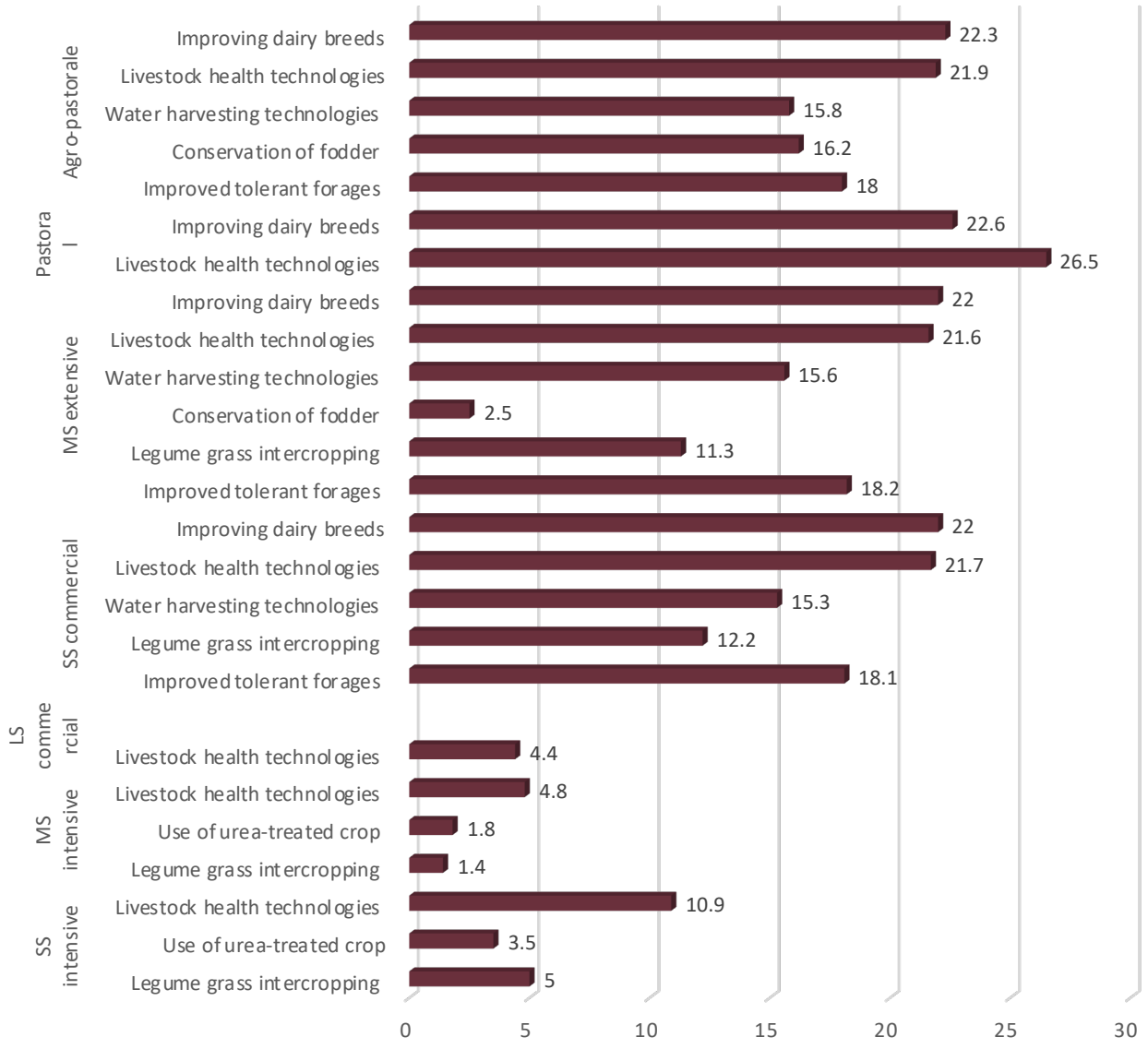
Productivity & Climate Solutions: GHG emissions by the dairy sector

- The dairy cattle sector in Uganda is responsible for the emission of about 19.1 million tons CO2eq
- More than two-thirds of the total emissions are concentrated in three regions with the highest share of the national dairy herd: Eastern (24%), Western (23%), and Central Province (22%)
- The GHG emissions profile is dominated by methane (98.6%); nitrous oxide (N2O) and carbon dioxide (CO2) contribute 1.3 and 0.1% of the total emissions, respectively
- Approximately 79% of the emissions arise from methane produced by the rumination of cows and 19.7% from the management of stored manure. Emissions arising from other sources make a negligible contribution to overall emissions

FAO, New Zealand Agricultural Greenhouse Gas Research Centre, 2019. Options for low emission development in the Uganda dairy sector - reducing enteric methane for food security and livelihoods. Rome, p. 39 pp.

Potential impact of adoption of different types of improved practices on emission intensity in dairy farms in different production systems relative to baseline (%)



- Across the various production systems, CH4 emission intensity can be reduced by 1.5 percent to 27 percent through adoption of different types of productivity improvement interventions
- This reduction in CH4 emission intensity corresponds to 2 to 40 percent increase in milk productivity
- For most of the interventions, the potential reduction in emission intensities are highest in small scale commercial, medium scale extensive, pastoral and agro-pastoral systems
- Further analysis indicated that adoption of combinations of interventions aimed at improving feed availability and quality water availability, genetic potential and herd health can potentially result in a reduction of 5 to 52 percent in methane emission intensity relative to the baseline.

Interventions at farm level to increase productivity and reduce emissions in the dairy sector

	Production systems		Impact		
Interventions	**Traditional production system**	**Commercial production system**	**Productivity**	**Adaptation**	**Mitigation**
Improved dairy genetics	Artificial insemination		**	*	
	higher producing livestock breeds		**	*	
Improved feeding and nutrition	High yield forages		*	**	**
	Precision feeding, Use of Toxin binders, concentrate feeds		**		**
	Production and supply of hay and silage		*	**	*
Water management	Water harvesting systems		**	**	
Cattle management	Drugs and vaccines		**		
Solar Energy	PV/Solar energy		*	*	**
Bio energy	anaerobic biodigesters		*	*	**
	Bio-slurry		**	*	**
Access to finance	Agrifintech		**		

****Direct Impact, * Indirect impact**

- These are different interventions that would increase productivity on farm and reduce green house gas emissions.
- These are high impact priority interventions on farm.

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Climate smart technologies in the dairy value chain in Uganda (On farm)

Interventions to improve productivity of livestock and reduce GHG emissions	Improve pasture and forage management
	Training on climate smart technologies such as high yield forages and link to forage seeds etc
	Promote the production and supply of hay and silage for the farmers to utilize during shortages
Interventions that improve feed efficiency through processing and diet manipulation	Precision feeding through formulation of cost-effective feeds matching animal's genetic abilities
	Enhancing quality and utilization of concentrate feeds on the market. Use of toxin binders to increase feed efficiency
	Enhancing the utilization of cereals and legumes crop residues, industrial by products, and feed additives

Source: V. Arnaoudov, B.Lukuyu & R. Caguioa (2017). Nationally Appropriate Mitigation Action on Climate-Smart Dairy Livestock Value Chains in Uganda. United Nations Development Programme

Climate smart technologies in the dairy value chain in Uganda (On farm)

Interventions that improve milk collection and quality

Improving milk colling at MCCs, milk purchase points and storage points. Cooling, storage and testing facilities should be emphasised to ensure that the quality of the milk products is retained

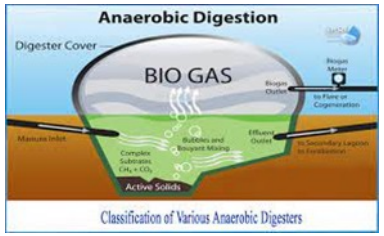
Improve milk packaging using recyclable materials

Required policy and regulatory support

Operationalising the Animal Feed Standards Framework to support improvement in quality of commercial feeds

Source: V. Arnaoudov, B.Lukuyu & R. Caguioa (2017). Nationally Appropriate Mitigation Action on Climate-Smart Dairy Livestock Value Chains in Uganda. United Nations Development Programme

Climate smart technologies in the dairy value chain in Uganda (On farm)



Interventions to improve productivity of livestock and reduce GHG emissions

- Improve access to better resource efficient and yet higher producing livestock breeds
- Programs for prevention, control & eradication of diseases

Interventions that improve manure management and reduce GHG emissions

- Introduction of the use of anaerobic biodigesters to treat animal waste from livestock operations
- Scaling up the use of Biodigester for producing Biogas
- Promote use of Bio slurry for crop production including forages

Source: V. Arnaoudov, B.Lukuyu & R. Caguioa (2017). Nationally Appropriate Mitigation Action on Climate-Smart Dairy Livestock Value Chains in Uganda. United Nations Development Programme

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Significant barriers to farmers adopting productivity enhancing interventions

- Farmers may not be aware of the technologies or inputs that can enhance productivity while also being climate-smart. Information dissemination can be challenging, particularly in remote or rural areas.
- Farmers might lack the necessary knowledge and skills to implement these solutions effectively.
- Climate smart technologies require high upfront investment, with farmers yet the price of milk is low most especially in the wet season.
- Farmer mainly get loans from SACCOs for basic needs like for school fees, hospital bills and not for increasing productivity at the farm.
- Business case of costs and benefits of using the interventions is limited.
- Farmers recognize the importance of some technologies like water harvesting but hesitate to embrace these practices due to the substantial initial investment required, with economic advantages only realized over time.

Farmer engagement models for driving adoption:

- **Trader – farmer partnership**: In this model, traders assist farmers through interest-free loans and advances that are repaid when the farmers sell their milk. Others extend support to farmers by offering training sessions on proper milk handling and hygiene. Traders also pay on time. Some traders own MCCs where farmers bring their milk.
- **Cooperative owned MCCs**: This is a key farmer service delivery model , play a pivotal role in supporting farmers in various ways, primarily in terms of transportation and the collective sale of milk on behalf of farmers. These cooperatives also serve as aggregation point for production inputs and services, market access, financial services, tractor hiring services, tent and chair hiring for functions etc. They pay farmers **every 2 weeks** for the milk collected daily. One cooperative (Dwaniro coop society) has some extra services it offers farmers for example a Food Store to offers items like maize meal to farmers during the dry season; Demo Garden to show farmers how to grow food crops; Veterinary and Extension Services; Salt for Cows; Fuel Station; Garage for motorcycle repair. Cooperatives are interested in implementing solar systems to power their milk collection centers (MCCs), but they face a significant hurdle due to the high installation costs. Dwaniro Cooperative, has successfully installed solar panels in one of their MCCs (8,000 L capacity). They received support from Heifer International.
- **Processors – farmer partnership** (e.g., Narka Dairies Ltd) provides multifaceted support to farmers, including training in disease control, artificial insemination, and proper milk handling. They also facilitate farmers' access to veterinary services, connect them with financial institutions like SACCOs, offer advances that align with milk sales, ensure timely payments (although not always guaranteed as they often prioritize product sales), collaborate with some cooperatives. They engage in advocacy efforts to secure grants for coolers, as well as training in milk production and feed management from the government on behalf of farmers. Processors provide pasture seeds at cheaper prices and farmers pay using the milk produced.

(Source: survey data)

Payment schedule for the various actors for the milk

- Payments usually depends on the agreement between the parties concerned and could be formal or informal agreement.

Actor relationships	**Payment modes**
Trader to farmer	Daily or weekly payment
Cooperative to farmer	After 15 days (2 weeks)
Traders to transporters	Daily or weekly payment
Processor to cooperative	After 15 days (2 weeks)
Processor to trader-	Weekly payment
Hotels/institutions to cooperatives or traders	Daily or weekly payment

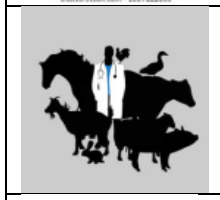
(Source: Key informant interviews)

Dairy cooperatives: Support services given to farmers

- Cooperatives have formed farmer allied partnerships with dairy farmers that offer various supporting services using a milk check off systems.
- The dairy hub model established during the EADD project in Dwaniro, Kiboga district has expanded to providing additional support services to farmers such as financial services (FOSA), providing food stuff (maize-meal) to households on a check off system, establishing fuel station, garage facilities to generate revenue.
- Some cooperatives are engaging in small-scale milk processing (e.g., making yoghurt etc.)

Key pillars of dairy cooperatives

- Organizing farmers & strengthening farmer organizations.
- Linking farmers to improved affordable production technologies; Genetics (AI), Feeds and feeding, Animal health care.
- Linking farmers to markets; farmer managed milk collection centres, bulk marketing, support to farmer groups to negotiate and sign milk supply contract with buyers.
- Building the capacity of farmers, service providers and stimulating businesses in the dairy hub

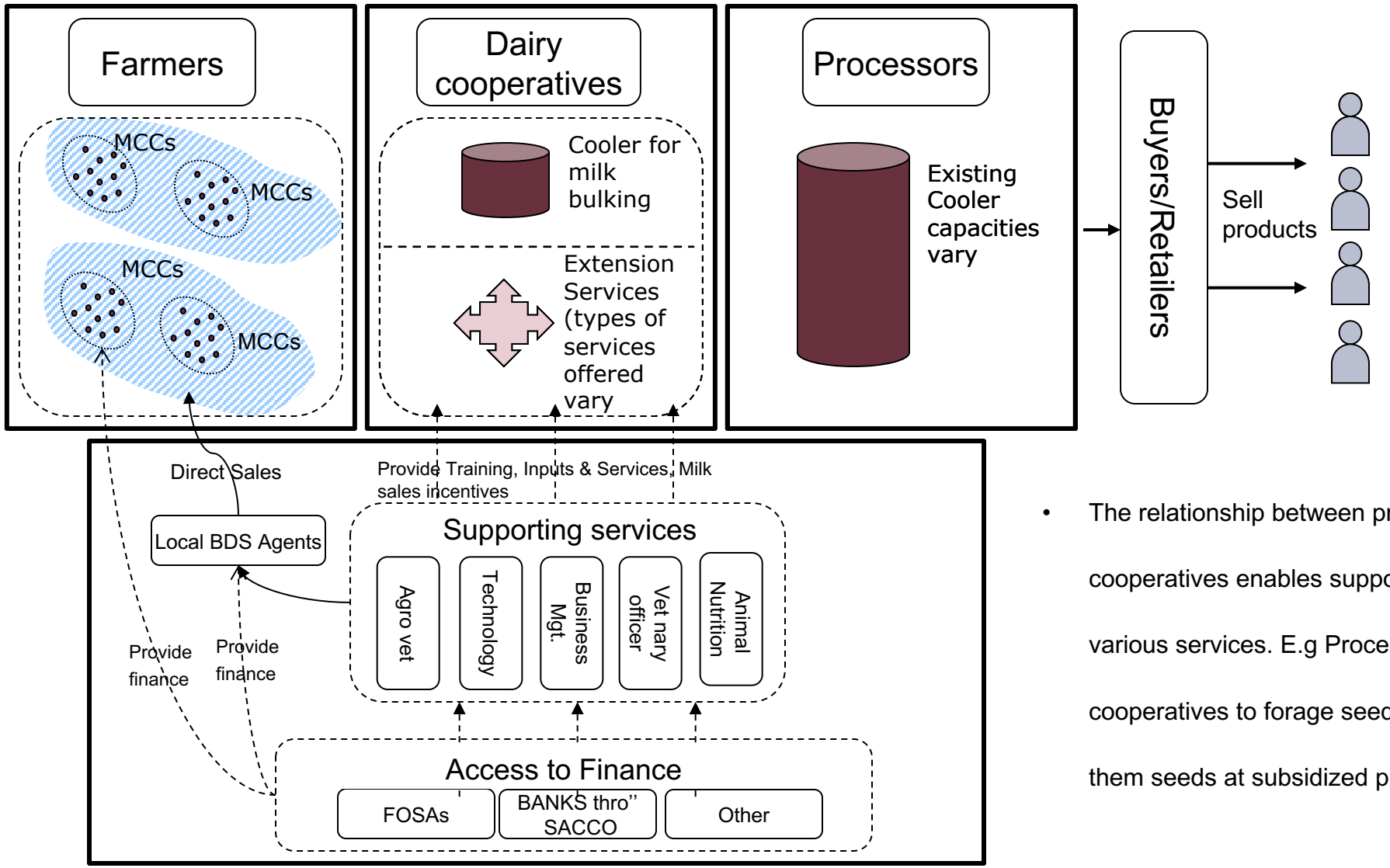
Type of service	How dairy hubs impact farmers
	Milk aggregation: Milk Aggregation: The cooperative collects and aggregates farmers' milk, simplifying the marketing and sale of their dairy products. Through the milk hubs, farmers can borrow money against the milk they already delivered and use it to pay their monthly bills.
	Food store: Most dairy cooperative operates a food store that offers food items like maize meal and matooke to farmers, particularly during the dry season. Farmers can buy these products against milk supplied.
	Demonstration gardens: The cooperative maintains a demonstration garden where they provide training to farmers on crop production techniques including forages.
	Access to inputs: Dairy cooperatives have agrovet stores where farmers can purchase inputs such as milk cans, feed, vet medicines they need to keep their animals healthy etc. This gives them access to critical supplies at a low cost, and payment in instalments helping to increase yields on their farms and ultimately resulting in higher incomes.
	Veterinary and Extension Services: The cooperative offers veterinary services and has an extension worker to provide guidance and support to farmers. The dairy cooperative links farmers to local veterinarians to provide basic services like vaccinations. Other include tractor and fuel services.
	Financial Services: Farmers have access to financial services, including loans. The cooperative can also act as a guarantor for members seeking larger loans from other financial institutions, such as banks – a service that is particularly important because many farmers do not have a formal credit rating.

Dairy Cooperatives milk collection and chilling model (Processor retail)

Dairy Cooperative managed milk collection centers)

Dairy cooperatives enter into milk sale agreements with one or more processors

Existing Processors purchase milk from dairy cooperatives, package and sell milk to retailers



- The relationship between processors and cooperatives enables support in access to various services. E.g Processors link cooperatives to forage seed companies and sell them seeds at subsidized prices.

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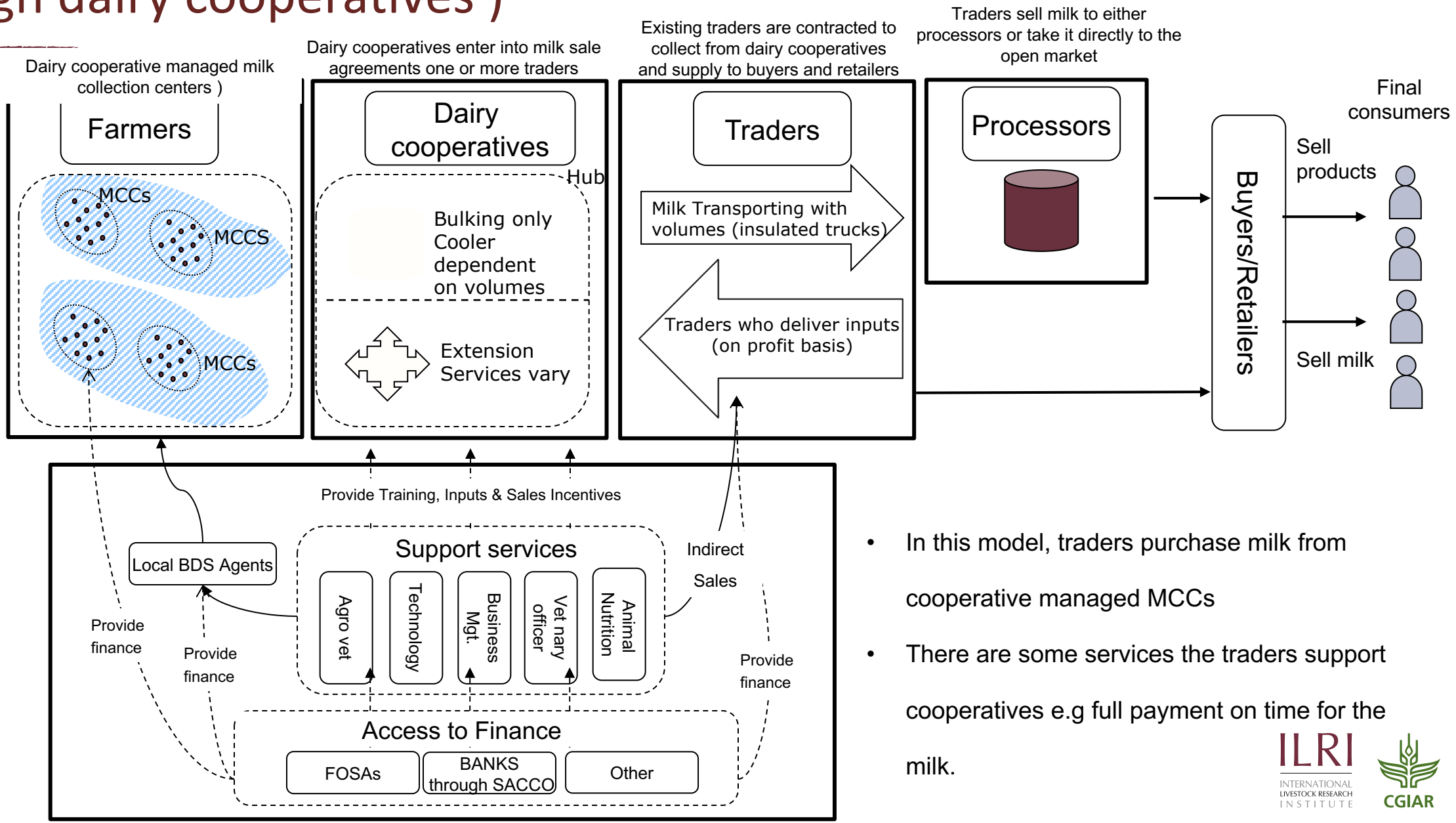
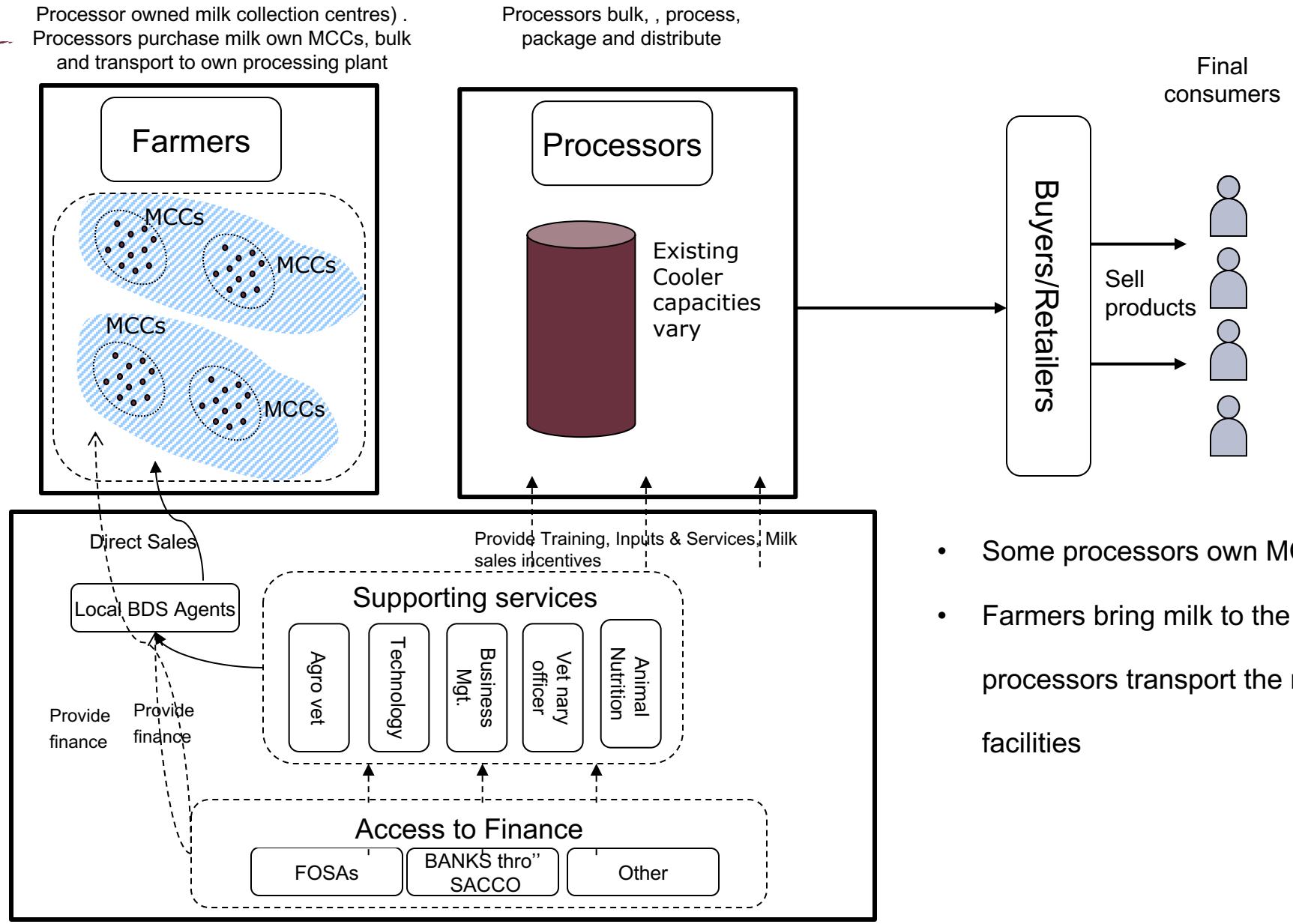
Dairy Cooperative milk collection and bulking model (Trader retail through dairy cooperatives)



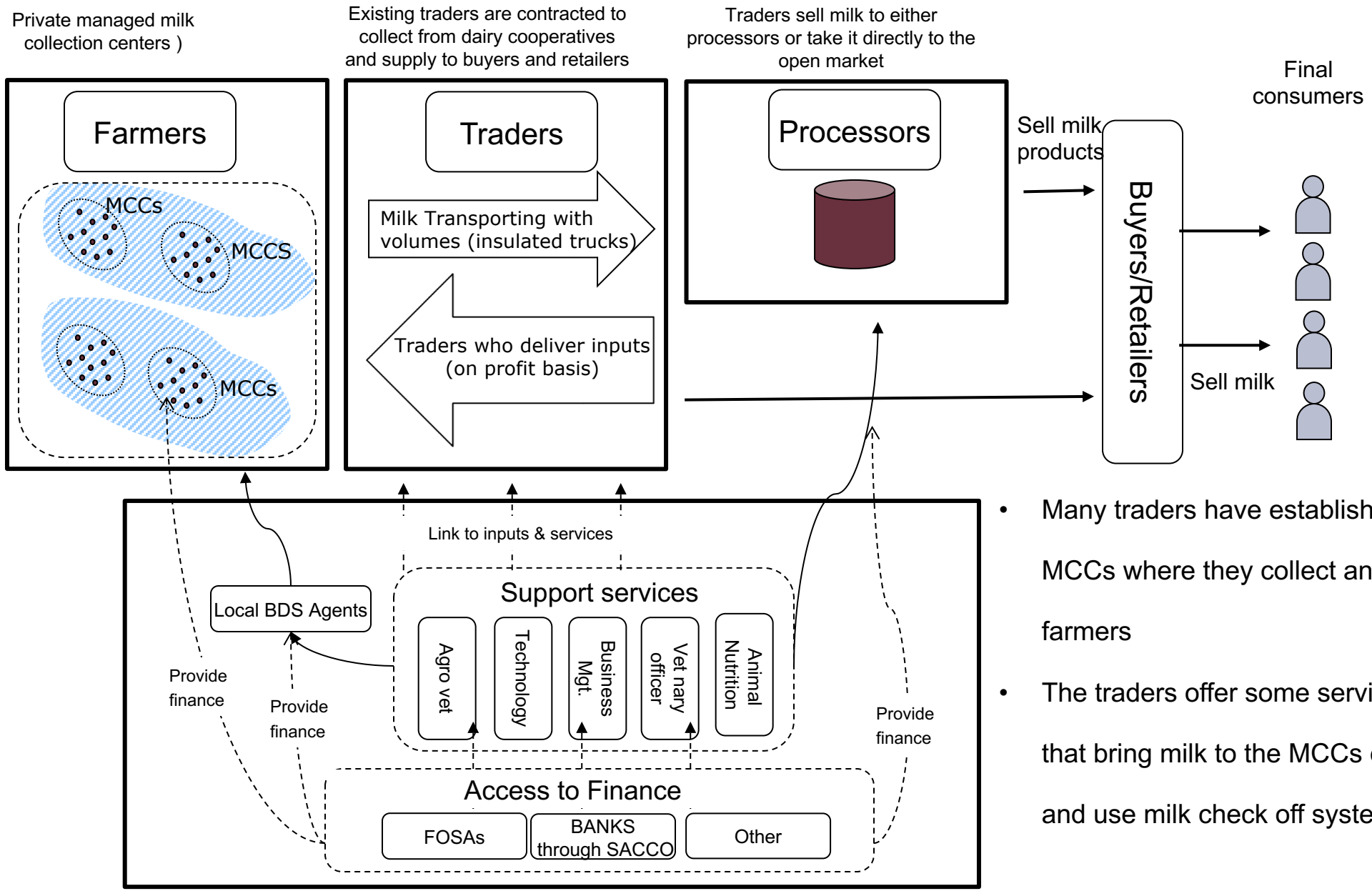
- In this model, traders purchase milk from cooperative managed MCCs
- There are some services the traders support cooperatives e.g full payment on time for the milk.

Processor milk collection and chilling model – via own MCCS (Processor retail).



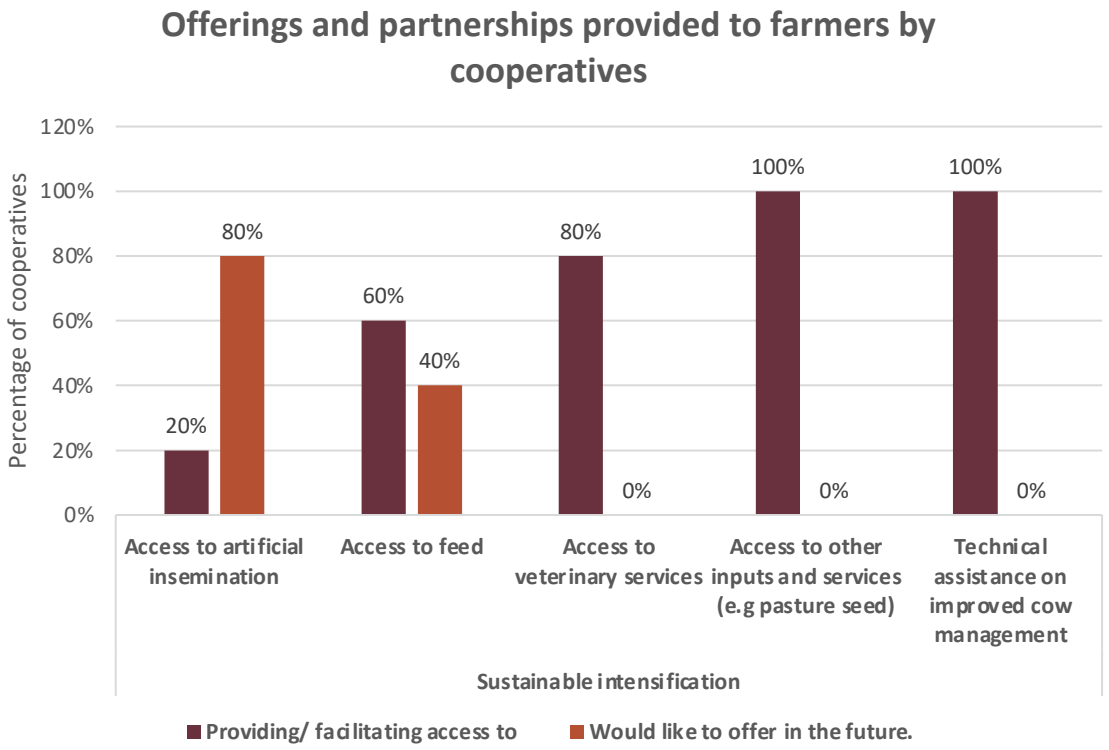
- Some processors own MCCs.
- Farmers bring milk to the MCCs, and processors transport the milk to their facilities

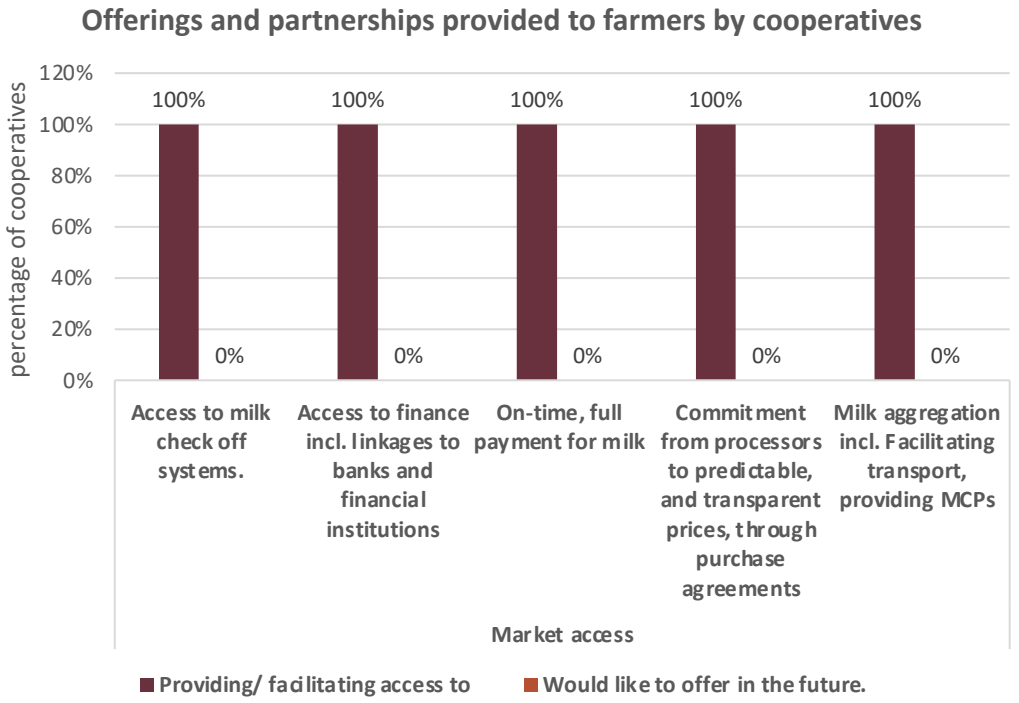
Traders collecting and bulking milk model (Trader retail via processors or direct to the open market)



- Many traders have established their own MCCs where they collect and bulk milk from farmers
- The traders offer some services to the farmers that bring milk to the MCCs e.g quick loans and use milk check off system

Farmer allied partnerships (Cooperatives)





- Majority of cooperatives provide access/ facilitate farmers access to inputs, technical assistance, and extension services .
- Majority of cooperatives would like to offer access to artificial insemination to the farmers in future.
- All cooperatives surveyed are providing / facilitating market access to the farmers

(Source: survey data)

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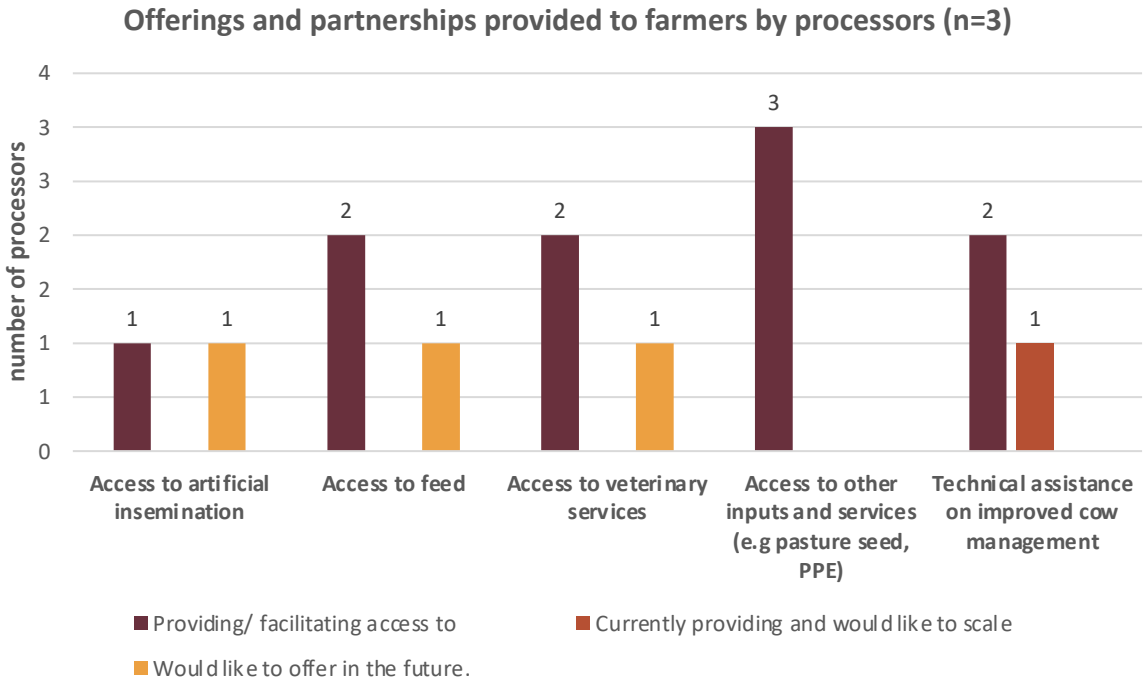
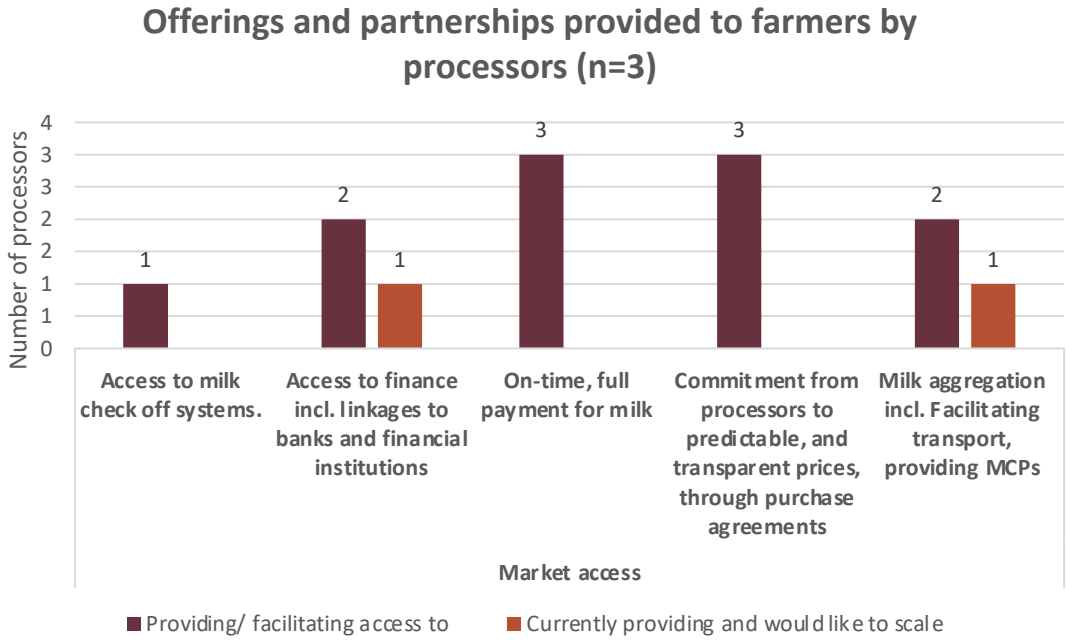
Farmer allied partnerships (Processors)





- Only 3 processors out of the 11 surveyed had partnerships with farmers.
- All the 3 processors provide access/ facilitate farmers access to other inputs (pasture seeds, PPE), while most of them facilitate access to technical assistance, feed and extension services .
- One processor would like to offer access to artificial insemination to the farmers in future.
- All the processors surveyed are providing / facilitating access to on time full payments, commitment to transparent prices and access to finance to the farmers
- One processor would like to scale access to finance and milk aggregation to farmers

(Source: survey data)

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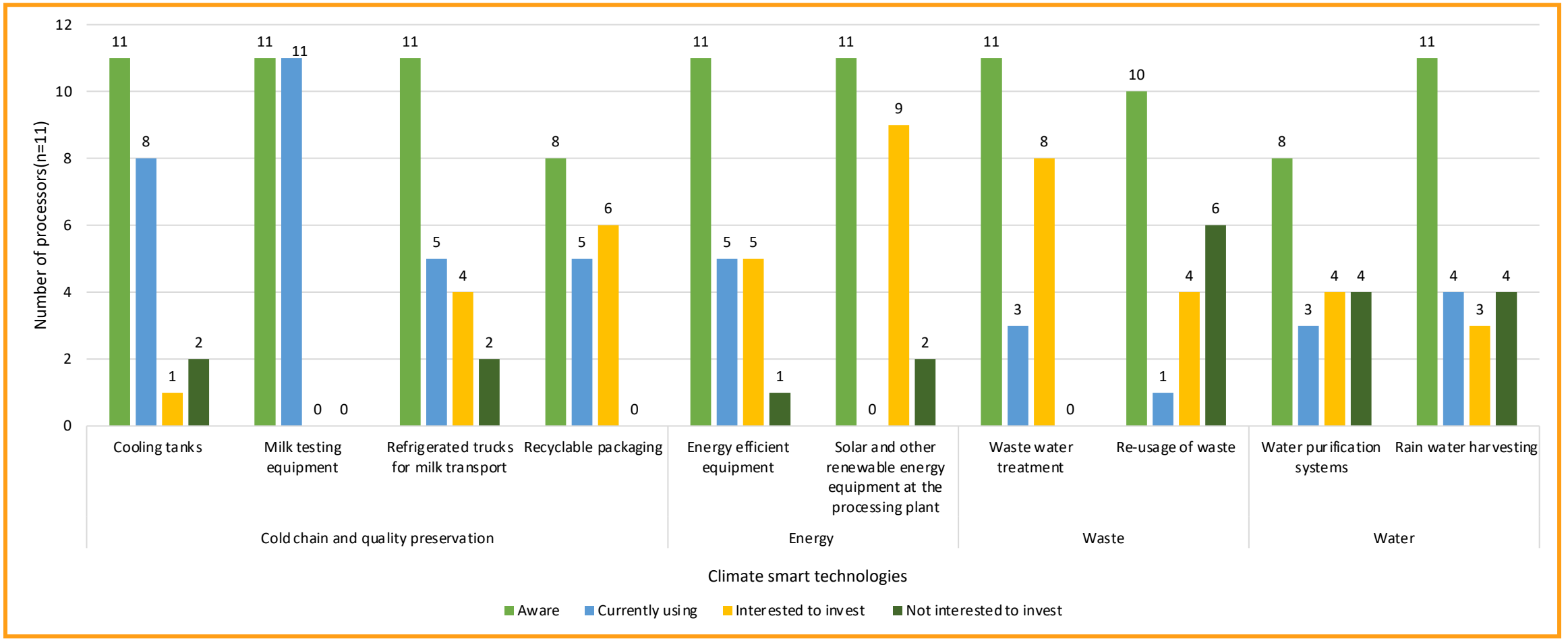
Barriers to scaling farmer-allied operations are faced across models

- Access to capital or funds to enable the support by various actors to farmers e.g lack of funds to include input shops at MCCs for good quality products to farmers; providing advance payments to farmers and use of milk check off system.
- Failure for on-time payments to farmers in some seasons because of lack of funds
- Access to quality, affordable inputs and services necessary for operations (e.g., drugs, vaccines, feeds, milk cans)
- Poor road infrastructure limit access to some services e.g extension services to farmers that are deep down in the villages
- The limited ratio of extension workers to the number of farmers they reach presents a significant obstacle to expanding support to a larger farmer base. Additionally, the unavailability of these extension workers to deliver essential services to farmers further compounds the issue.
- Certain processors may be inclined to collaborate with farmers due to political factors, as a dominant large processor holds a significant share of the market. The intense competition among these major processors results in one of them offering higher milk prices to farmers, dissuading farmers from engaging with other processors.
- The volatile nature of milk prices offered by processors poses a challenge for cooperatives in persuading certain farmers to become members of their cooperative.
- Farmers' production of low-quality milk, coupled with low milk production most especially in the dry season, is a significant concern.

PADNET Implications

- To expand coverage in rural areas and enhance the delivery of extension services as well as to bolster financial literacy, a greater number of highly skilled extension officers is needed.
- To ensure the provision of access to quality, affordable inputs and services, it is essential to both offer standardized input products and regulate the input dealers.
- Access to cost-effective financing via partnerships with commercial banks and development institutions is a vital component in enabling processors, cooperatives, and traders to secure ample working capital for the establishment of check-off systems and the extension of credit to farmers.
- Create or support government or private extension service agencies that will be responsible for delivering services to dairy farmers. These agencies should be staffed with trained professionals.
- Facilitate the sharing of market information with farmers, enabling them to make informed decisions about pricing and production.
- Ensure that there is a regulatory framework in place that promotes competition while safeguarding the interests of both farmers and processors. Regulations should be designed to prevent anticompetitive practices and ensure fair treatment.
- Establish and enforce regulations and standards for dairy equipment like milk cans, covering design, materials, manufacturing, and performance specifications. Ensure that these regulations align with international standards.

Awareness, Usage and Investment in CSTs by processors (n=11)



- All processors are using milking testing equipment, and majority have cooling equipment and refrigerated trucks
- Processors are aware about but not currently using solar and other renewable energy equipment however, their interest to invest in these technologies is high
- Similarly, the application of water and waste management practices is not being used currently but processors are aware about them and are interest to invest in them
- There is high awareness of water purification and harvesting technologies amongst processors, however the use still remains low

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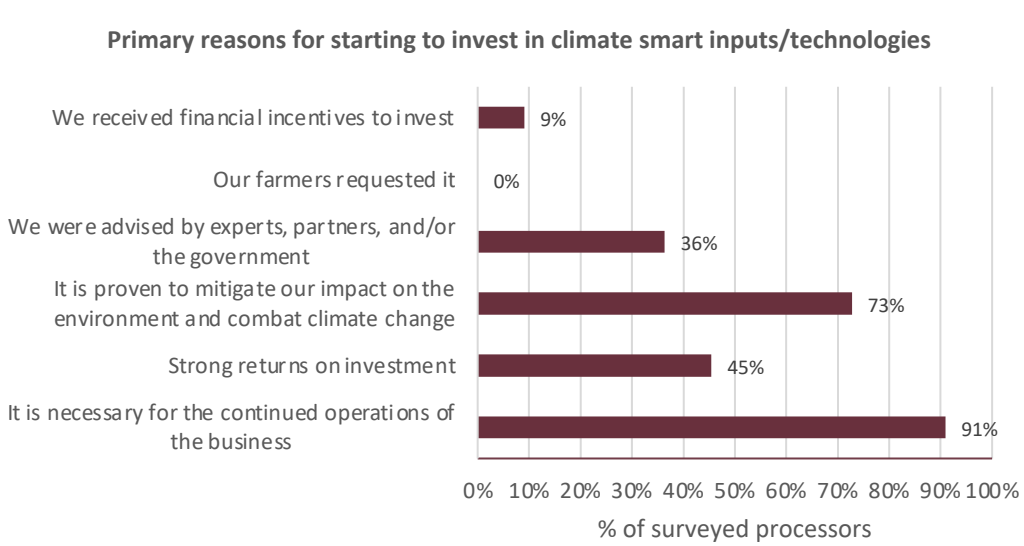
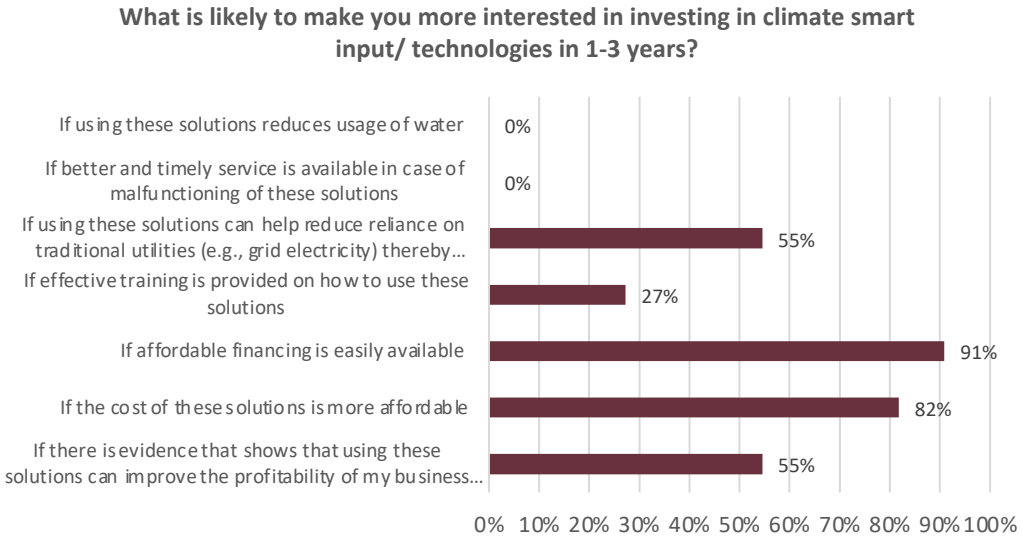
Reasons and interest for processors to invest in climate smart inputs and technologies (Survey findings)





- Majority of processors are interested in investing in climate-smart technologies if they are cost efficient and there is a financial incentive to invest.
- They are concerned about the high cost of investment in climate smart inputs/ technologies. A mindset change is required to enhance the adoption of these technologies.

(Source: survey data)

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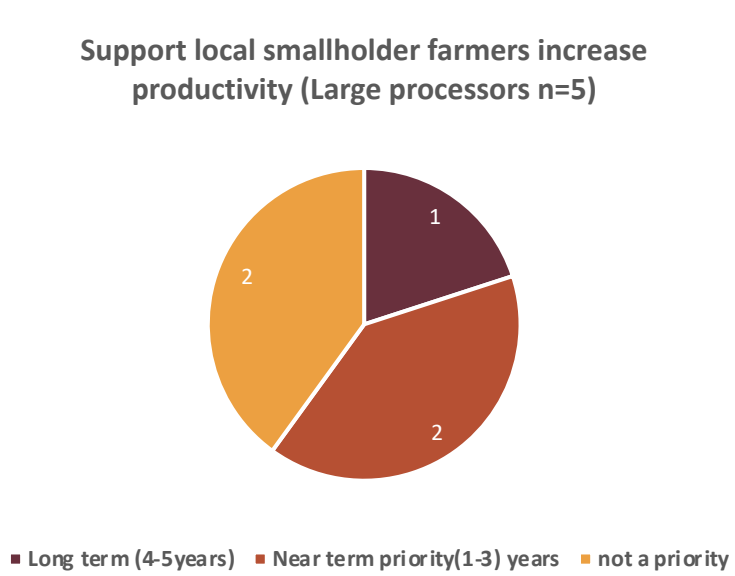
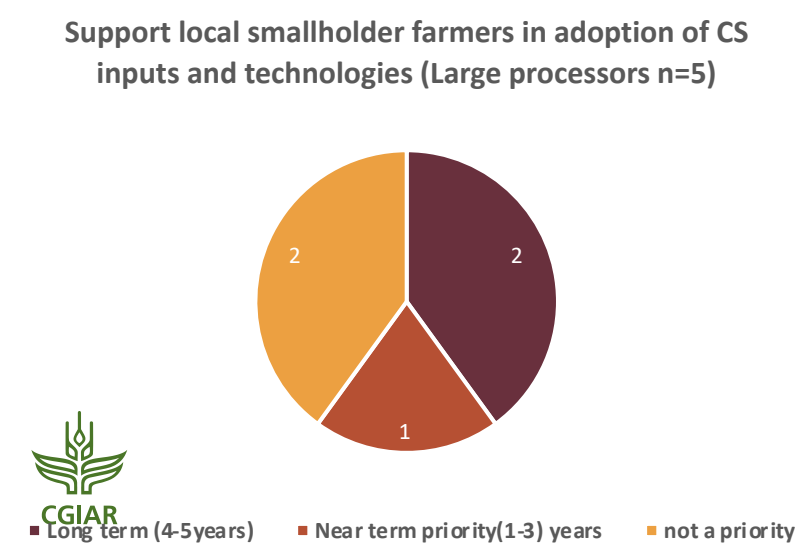
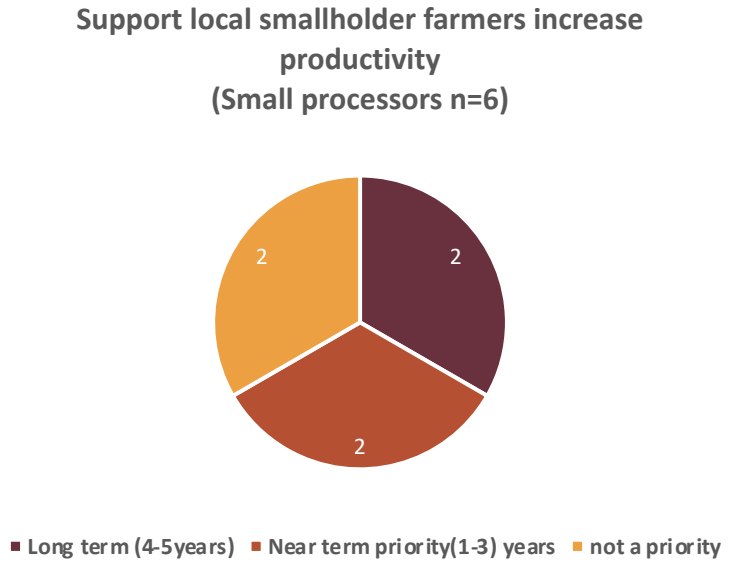
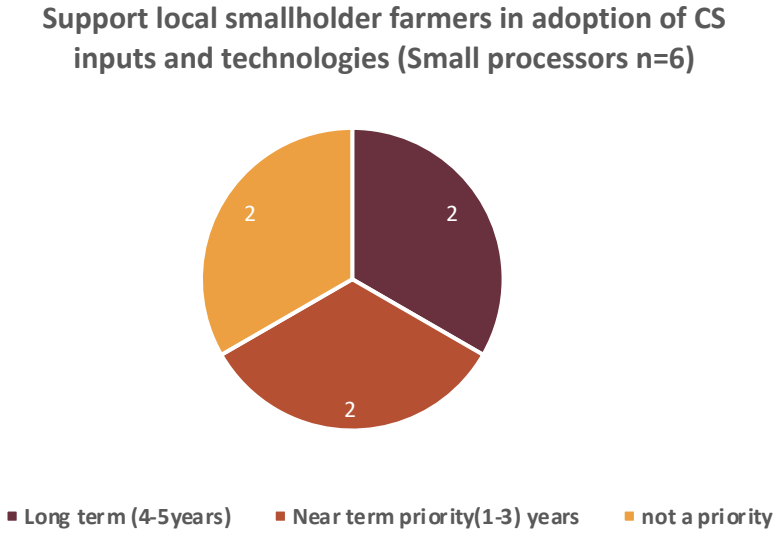
Priority of processors in supporting farmers to adopt climate smart inputs and technologies (Survey findings)









- 2 out of 5 large processors are interested to support farmers to increase productivity in the near term while 2 other large processors do not see it as a priority in their business.
- This is similar to the small processors surveyed.
- Almost half of the large processors and small processors are prioritizing supporting farmers in adopting CS technologies in the long term. But also, 2 of 6 small processors are interested in supporting farmers to adopt CS technologies in the near term.

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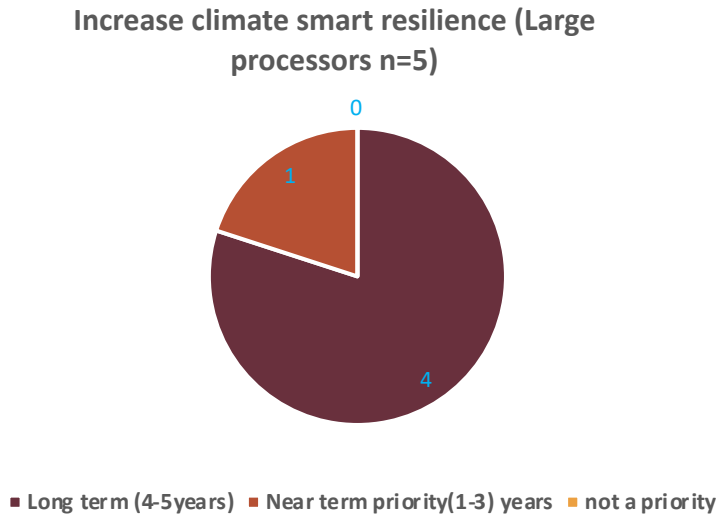
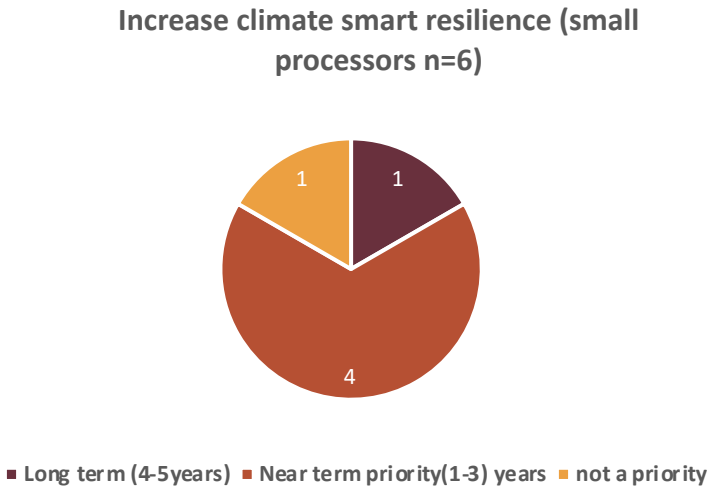
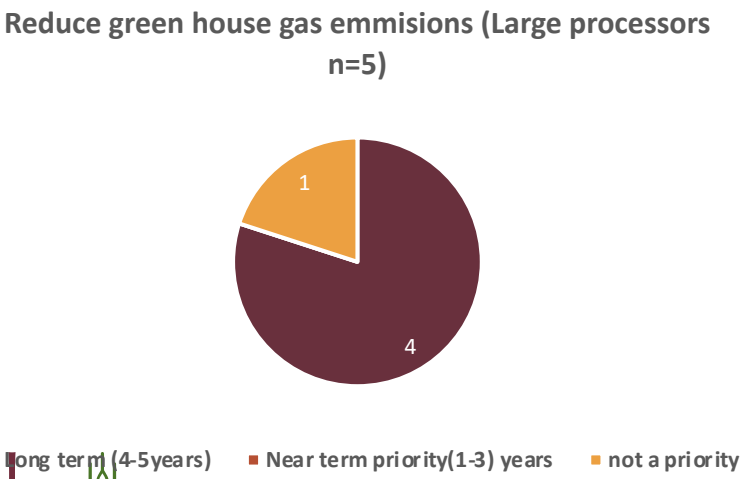
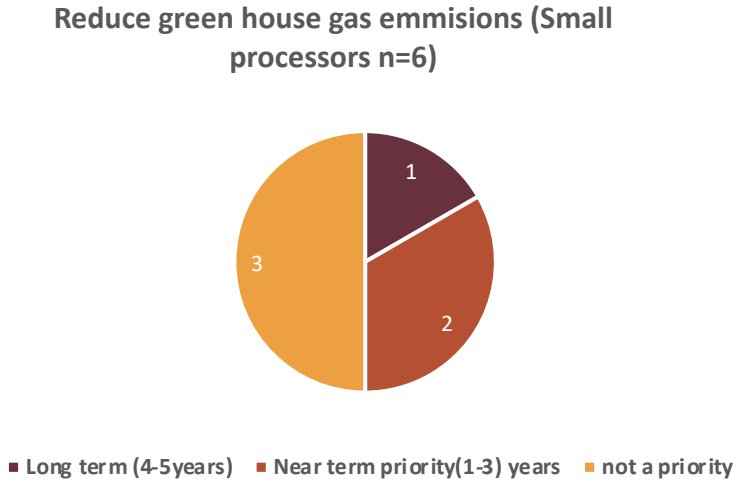
Priority of processors in supporting farmers to adopt climate smart inputs and technologies (Survey findings) cont.









- Almost all large processors are prioritizing the increase in climate smart resilience in the long term yet almost all small processors are prioritizing increase in climate smart resilience in the near term.
- Almost all processors mentioned prioritizing reduction in greenhouse emissions in the long term while half of the small processors are not prioritizing reducing greenhouse gas emissions in their businesses.

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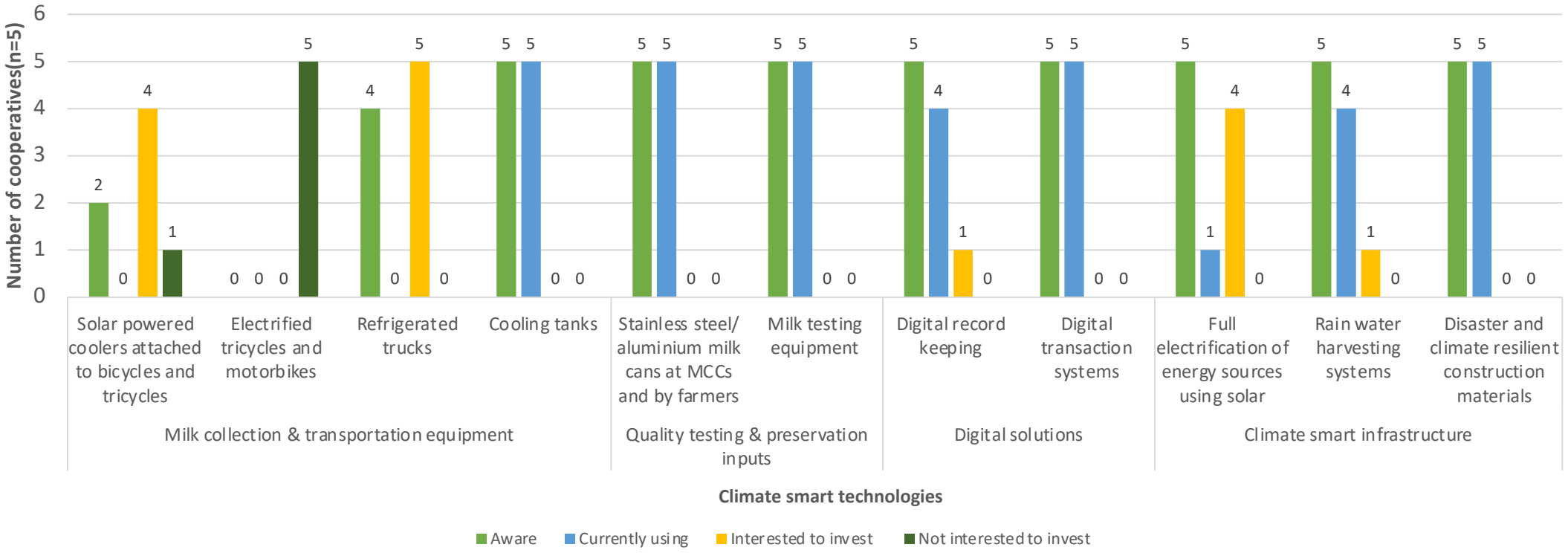
Awareness, Usage and investing in CSTs by aggregators (n=5)



- Aggregators are currently not using solar powered equipment nor electrified tricycles or refrigerated trucks in milk collection and transportation and many of them are willing to invest in the technologies
- All aggregators are aware and are using stainless stell cans and tested for milk quality
- Majority of the aggregators are aware and are keeping records and transacting digitally. The few who are not using are willing to invest in the technology
- All aggregators are aware about electrification of energy sources using solar buy only one of them is currently using. These who are not currently using are willing to invest in the technologies
- Majority are aware and using rain-water harvesting systems

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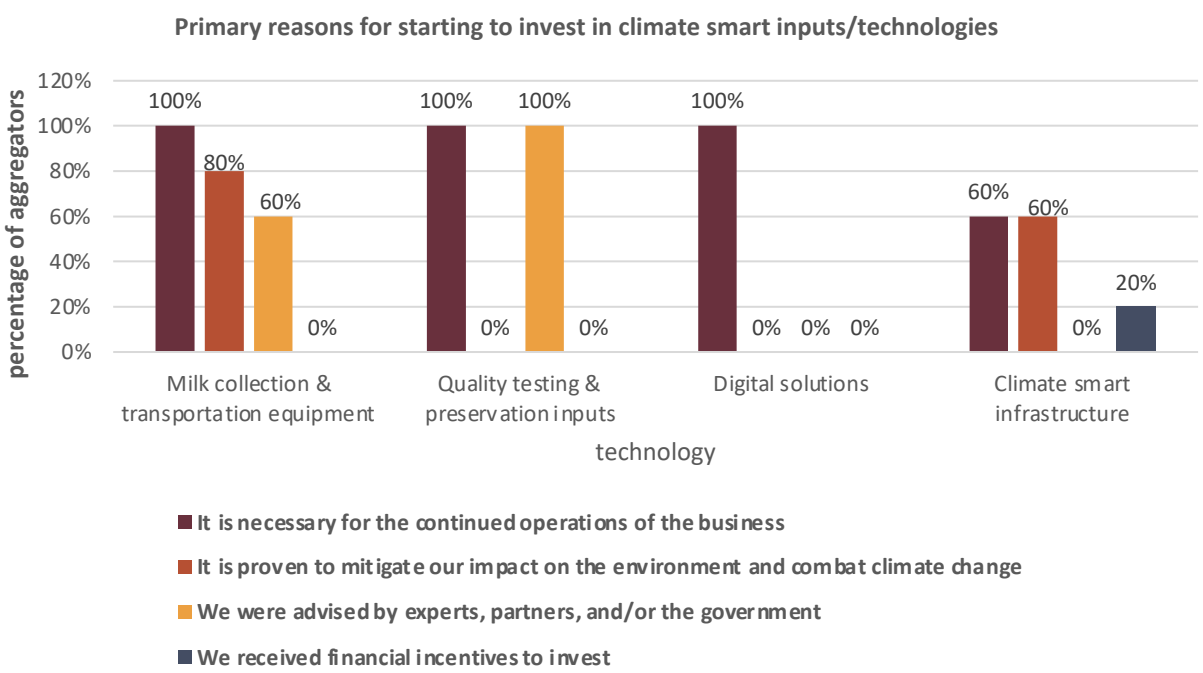
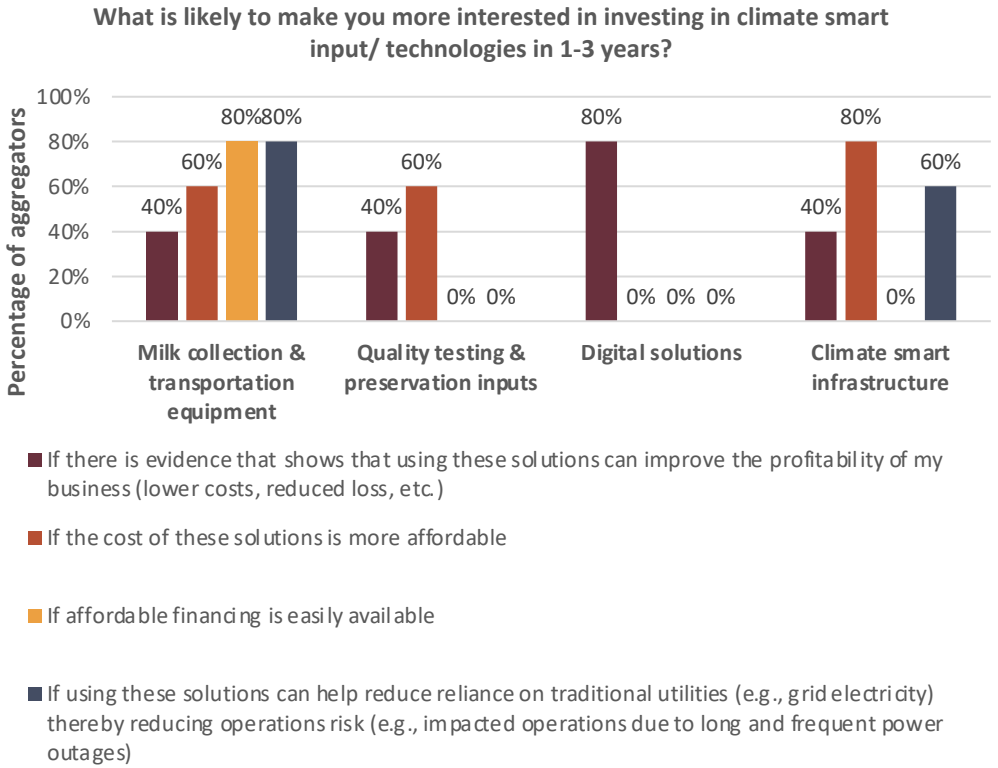
Reasons and interest for aggregators to invest in climate smart inputs and technologies





- Majority of aggregators are interested in investing in climate-smart technologies if they are cost efficient, high investment returns and there is a financial incentive to invest.
- They are also interested to invest in the technologies if these can help reduce reliance on traditional utilities (Milk collection equipment and Climate smart infrastructure like Solar).

(Source: survey data)

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Case study of a cooperative using solar at the MCC

- Full solar electrification and powering 2 milk coolers with installed capacity of 3,000 liters and 5,000 liters, respectively.
- Initially used 2 diesel generators
  - 30KVA generator and would spend 40 liters of diesel per day
  - 20KVA generator and would spend 35 liters per day

  Total cost per day was **350,000 Ugx per day** on fuel.

  Standing cost and generator service was 420,000 ugx per month.
- Solar electrification was done by Heifer international and installed by Aptech
  - An MOU was signed, and the cooperative will pay for the solar installation for 20 years, but the property will become for the cooperative after 10 years
  - They pay using solar units. Per day the MCC uses 80 units of solar and each unit costs 1,400 ugx (**112,000 ugx per day**).
- Heifer incurs the cost of maintenance but after 10 years, the cooperative will take over.
  - Some members have been trained as technicians to do some small technical repairs, but complicated ones are done by Aptech.

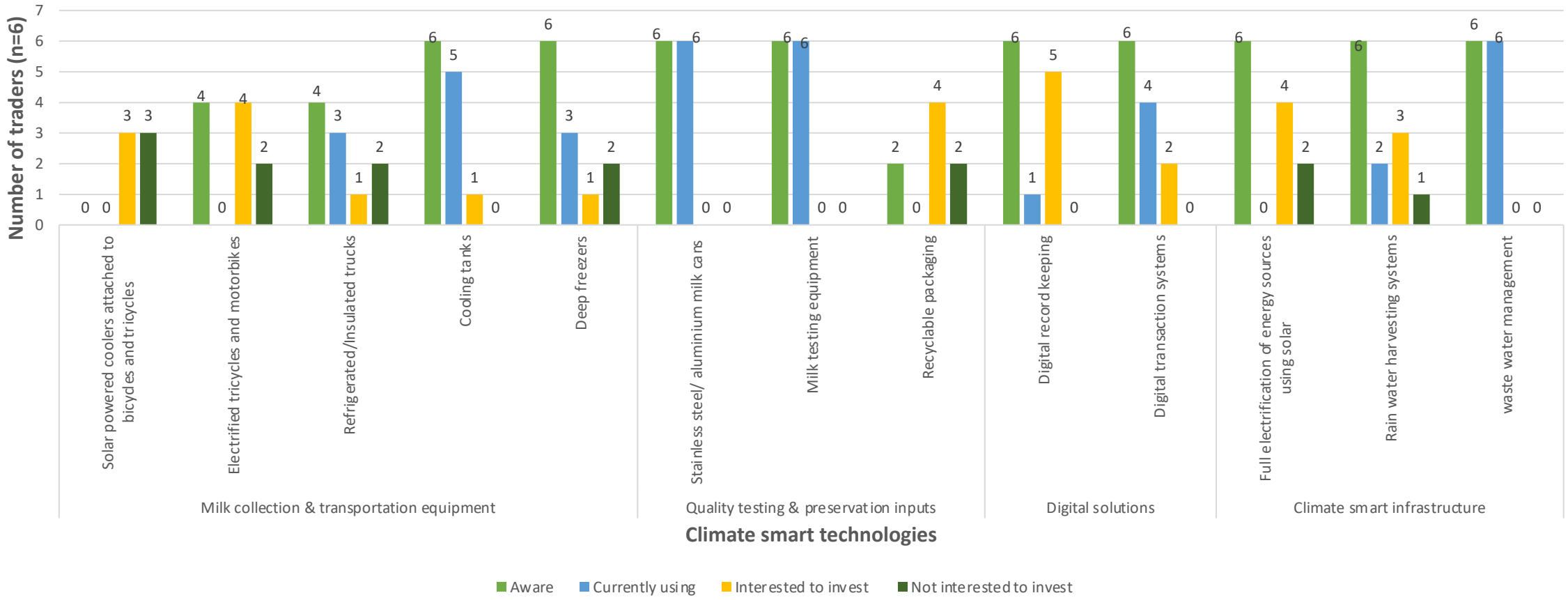
Modes of milk transportation (Survey findings)

- All MCCs transport milk to processing plants using insulated trucks.

- Transportation of milk from farms to MCCs
  - While all 5 cooperatives surveyed transport milk using motor bikes in stainless steel cans, the use of jerricans (plastic milk cans) is also common
  - Three (3) dairy cooperatives out of the 5 surveyed transport milk collected from farms using insulated trucks
  - One dairy cooperative mentioned that some farmers transport milk to MCCs by foot, although these are very few.

(Source: Survey data)

Awareness, Usage and investing in CSTs by traders (n=6)



- Traders are aware and are mainly using lower capacity milk cooling tanks and deep freezers. About half of the use refrigerated/insulated trucks to transport.
- They are not aware about solar powered coolers but would want to invest in them. However, some of them are aware about electrified tricycles and would want to invest in them
- All traders use stainless steel cans and are doing basics milk tests. All traders are using non degradable material for packaging milk, but most are willing to invest in recyclable packaging.
- All traders are aware about digital record keeping but few are using the technology. However, majority are willing to invest in the technology
- All traders are aware of the solar technology but none of them are using . However, majority are willing invest in the technology.

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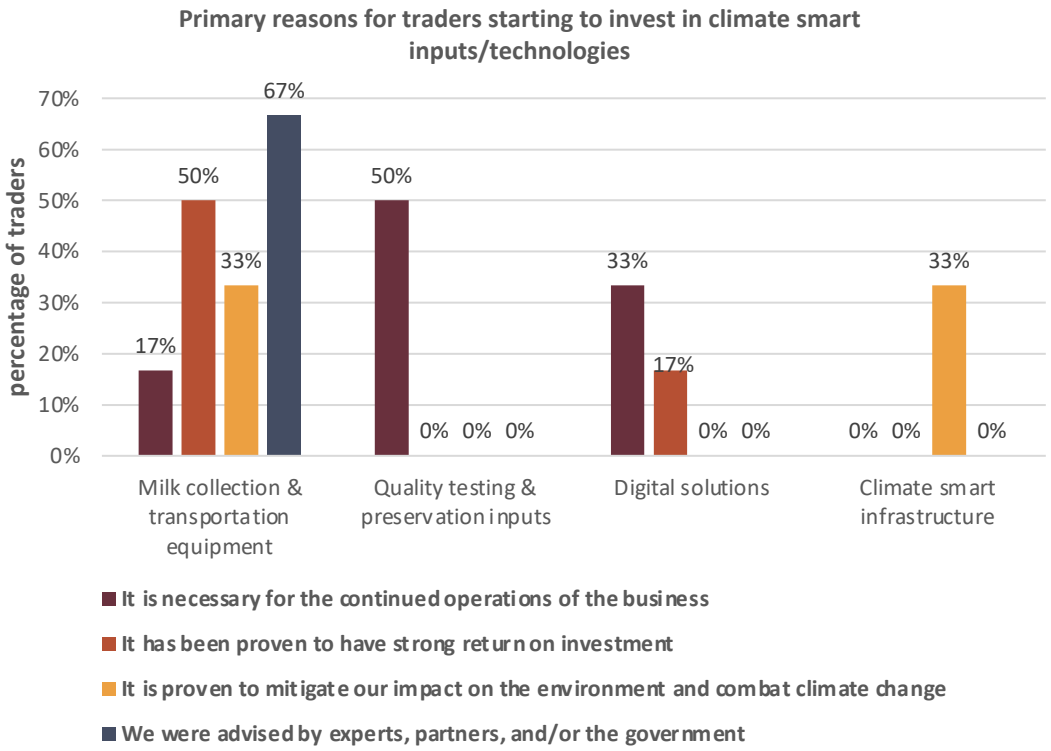
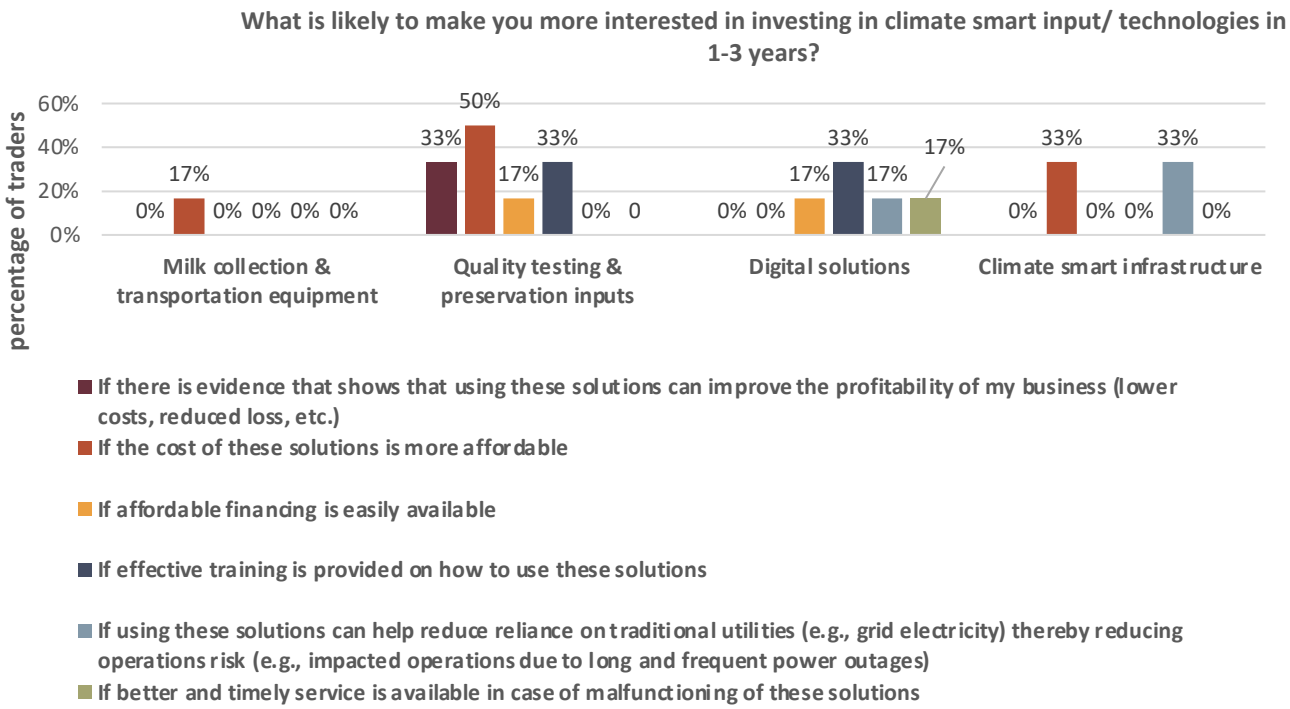
Reasons and interest for traders to invest in climate smart inputs and technologies





- Majority of traders are interested in investing in climate-smart technologies if they are cost efficient, profitability in using them , effective training is provided in using the inputs and there is a financial incentive to invest.
- They are also interested to invest in the technologies if these can help reduce reliance on traditional utilities (Climate smart infrastructure like Solar).

(Source: survey data)

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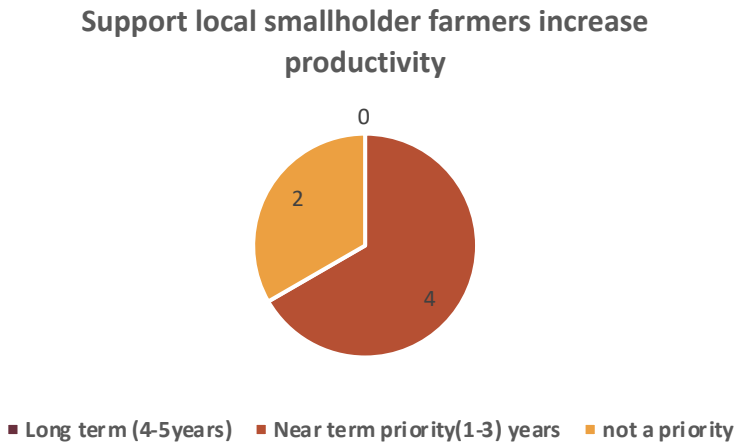
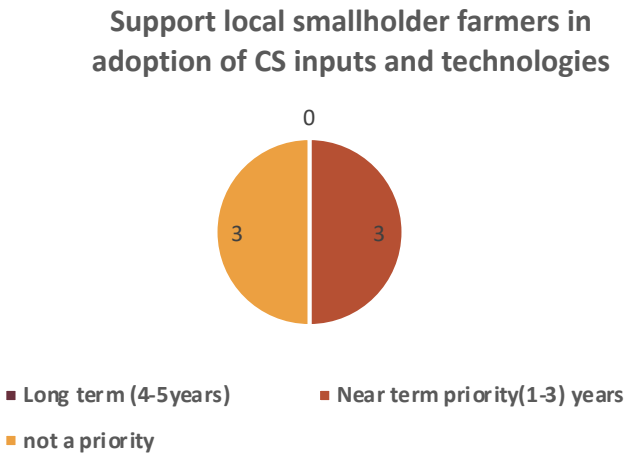
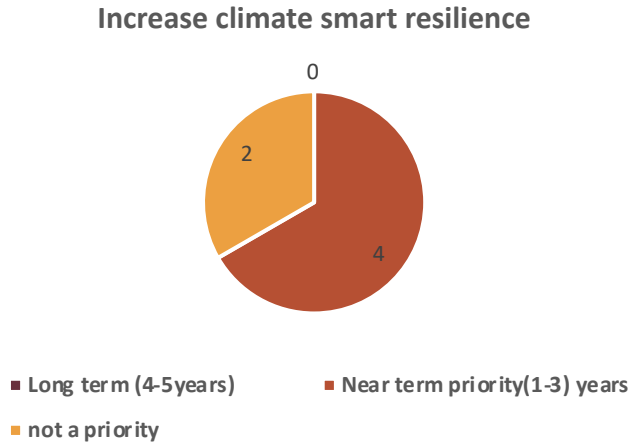
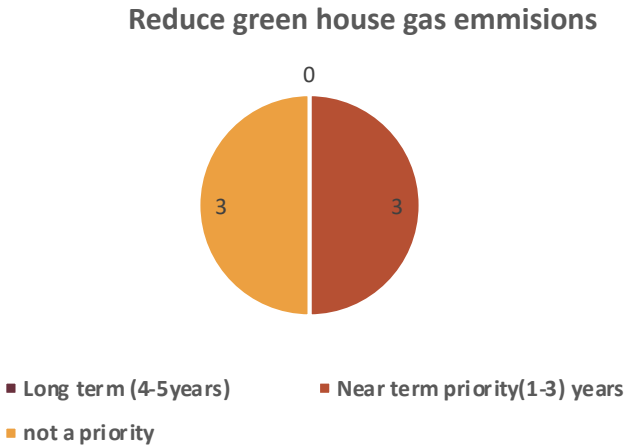
Priority of traders in supporting farmers to adopt climate smart inputs and technologies (Survey findings)









- More than half of the traders are prioritizing supporting farmers in increasing productivity in the near term.
- Half of the traders are also interested in supporting farmers in adoption of CS technologies in the near term.
- More than half of the traders mention that they are interested in increasing climate smart resilience as a near term priority.
- Half of the traders are also prioritizing reducing greenhouse emissions in the near term.

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Significant barriers in adopting climate smart technologies in the dairy value chain in Uganda (from literature)

- Lack of access to financial services and risk transfer mechanisms, such as credit, insurance, and savings, that can help them invest in climate smart practices and cope with climate shocks.
- Limited availability and quality of climate information and advisory services, such as weather forecasts, early warning systems, and extension support, that can help them make informed decisions and adopt appropriate technologies.
- Low prices of milk not motivating (the cost of input tend to be higher than the revenue from the outputs)
- High costs and low returns of some climate smart technologies, such as biogas digesters, irrigation systems, and improved breeds, that can deter farmers from adopting them or limit their scalability.
- Low awareness and knowledge of the benefits and potential of climate smart agriculture among farmers, policy makers, and other stakeholders, that can hinder the adoption and promotion of climate smart practices.
- Institutional and policy gaps and challenges, such as weak coordination, inadequate incentives, and conflicting mandates, that can affect the implementation and mainstreaming of climate smart agriculture in the dairy sector

Source: CIAT; BFS/USAID. 2017.; UNDP 2017

Barriers to scaling up of climate smart inputs/ technologies (from survey findings)

Processors and Cooperatives

- **Space Constraints**: Some small-scale processors often lack adequate space to install climate-smart technologies such as rainwater tanks, water purification systems, and waste treatment facilities. The places they work from are rented and small., which restricts their ability to implement certain technologies.
- **Technology Ownership**: Some small-scale processors, like Mackies, located at government incubation centres like Uganda Industrial Research Institute (UIRI) and Makerere University, are unable to switch to climate-smart technologies because they do not own the equipment. Instead, they rent or share these technologies with other processors, which can affect processing volumes due to scheduling constraints.
- **High Costs**: The high upfront costs associated with climate-smart technologies, such as solar systems, refrigerated trucks, energy-efficient equipment, water purification systems, and gas boilers, pose a significant financial barrier for many processors and MCCs.
- **Solar Efficiency:** Solar energy can be inconsistent in regions where there are months with insufficient sunlight to effectively charge solar panels, affecting the reliability of these systems.
- **Synthetic Natural Gas (SNG**): While SNG is an alternative fuel source for large processing plants and coolers, it is expensive and often needs to be imported from desert countries, resulting in additional costs.
- **Availability of Inputs**: Some inputs required for dairy processing, such as coal and coffee husks, are not readily available, which can affect the operations of processors relying on these resources. These are inputs that run the boilers.
- One small scale processor (REAL LTD) will not adopt some climate technologies that **reduce the use of manual labor** (E.G Digital bookkeeping, pasteurization machine etc.) because her entity's objective is to provide work to women who have gone through domestic violence. All technologies used at the plant are manual to provide jobs for the women.

Barriers to scaling up of climate smart inputs/ technologies (from survey findings)

Traders

- **High Cost of Climate-Smart Technologies**: Climate-smart technologies like electric motorcycles, solar-powered coolers, and full electrification of energy sources using solar are perceived as expensive, making their adoption challenging. High upfront costs.
- **Poor Road Infrastructure**: Inadequate road infrastructure can hinder the effective use of certain technologies like electric motorcycles and cars.
- **Spare Parts Availability**: Many climate-smart technologies, such as refrigerated trucks, face challenges with spare parts availability, which can affect maintenance and repair.
- **Solar Energy Capacity**: Concerns exist regarding the ability of solar energy technologies to generate the required kilowatts to power cooling systems and processing plants consistently.
- **Recyclable Packaging**: Recyclable packaging materials may not be suitable for reusing due to cleaning difficulties, potentially leading to contamination.
- **Resistance to Computer Usage**: Some traders prefer manual bookkeeping over computer-based systems during transactions, believing that computers are time-consuming. They may need effective training on how to use digital record system to manage their financial data.
- **Quality of Milk Cans**: Poor-quality milk cans sold to traders and farmers can easily get damaged when they fall, affecting milk handling and transportation.

PADNET Implications

- Climate-smart technologies have high upfront costs, and even when affordable financing is accessible, Governments and international organizations can provide subsidies or grants to farmers, aggregators and processors encourage their widespread adoption.
- Government of Uganda can impose regulations or incentives that encourage the adoption of climate-smart technologies and sustainable practices in the dairy sector.
- Financial institutions can offer low-interest loans specifically designed for the purchase of climate-smart technologies. These loans should have favorable terms and longer repayment periods to make them more accessible
- Conduct awareness campaigns to inform farmers and value chain actors about the long-term benefits of climate-smart technologies and their contribution to environmental sustainability.
- Continuously monitor the performance and impact of climate-smart technologies. Share success stories and results to motivate others to adopt these practices.
- Encourage cooperatives and associations among dairy farmers and value chain actors to pool resources and negotiate better deals with technology suppliers.
- Help farmers and value chain actors access better markets, where they can sell dairy products at higher prices. This added income can offset the initial costs of climate-smart technology.
- Capacity building of technicians to enable efficient maintenance and service of the technologies is needed. This should be accompanied by aftersales services by the suppliers of the technologies to farmers, cooperatives and processors.

Agenda

- Dairy sector overview
- Productivity & climate solutions
- **Supporting enterprises**
- Access to finance
- Government's role in enabling sector transformation

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Supporting enterprises surveyed

- **Feed:** Tunga Ltd promotes precision feeding by formulating/manufacture feed that suits an animal's genetic ability and additives (toxin binders) all of which reduce feed wastage within the animal. **Barriers to scale:** High cost of the main feed ingredients (maize and soybean) thus cost of their products has gone up has led to reduced demand.; Low milk costs make farmers to reconsider on whether to continue with the concentrates as it doesn't make economic sense ;The animal feed bill that doesn't seem to regulate the animal feeds industry is a big challenge for their successful operations.

- **Processing machinery**: Hola Dairies ltd have assembled a container processing plant which uses in built electricity heater system unlike commonly used boilers that use diesel or wood which most dairy processing companies around use. The unit cuts down energy costs by 50% through a heat regeneration process were incoming cold milk cools the outgoing pasteurized milk and this in turn heats the cool milk. **Barriers to scale:** High upfront costs as the spare parts are imported from Netherlands. Would need financing to assemble such in various cooperative owned MCCs.

- **Dairy cold chain equipment**: Snowman Supply ltd supplies equipment including coolers, large and small cans, milking cans, milk meter and cream separator machine. The company also offers individuals in milk processing training to make yoghurt and ice cream. **Barriers to scale:** Initial business model was providing of coolers and milk value addition equipment to cooperatives and to individual farmers on credit, but the low return rates of the credit offered to the farmers through equipment, forced the company cash on sale model; Taxes levied on some commonly used equipment in milk production has led increment in pricing of those equipment.

Supporting enterprises surveyed

Renewable energy : Solar today Ltd seeks to fill the gap in electricity access by using solar for majority of the rural population. Provides equipment for lighting as well as sale and promotion of solar heaters, solar milk coolers. The company works in partnership with financial institutions (Equity, Centenary, Post bank and microfinance) which enabled their customers to get their solar products under a loan system. **Barriers to scale:** During COVID the company lost close to 600 million Ugshs as people were unable to pay back the products that had been taken on credit. Partnerships that want to change the business objectives. Poor quality solar products on the market that makes potential customers biased over solar products.

Pasture seeds: Syova seeds is an affiliate of East African Seed company which availing to livestock farmers with seeds for propagation of high-quality forages. Alongside the introduction of the improved forages, they have embarked on campaigns to sensitize farmers about the cultivation of the new feeds together with silage making. They have demo plots propagated with the improved forages which farmers can access for learning purposes during field-days which they organize every year. **Barriers to scale**: Low demand for the improved feeds among local farmers; Due to slow turnover of seed stocks for the new forage varieties sometimes the germination rate deteriorates; Farmer complin about high prices of seeds; Unreliable rainfall

Supporting enterprises surveyed

Cooling systems: Wamala Engineers offer solar powered Small and large cooling systems. Small coolers are for individual farmers while the large cooling systems target farmer cooperatives. Give the small coolers on credit and the farmers pay back in 2 years **Barriers to scale:** Change of farmer mindset; Affordability (Financial capability); Limited market for the small cooling system; Need of funding on the company side since the systems are to be given out on credit; Taxes levied on the equipment (each machine is taxed 2 million).

Artificial Insemination: Worldwide Sire deal in Artificial insemination and imports semen from the US. Mobilize a few inseminators whom we work along with. Beef semen include breeds like Argus (Red and black), Simmental and Dual purpose include Brown Swiss while dairy include the Friesians. Import semen twice a year each shipment with 10,000 straws. **Barriers to scale**: The liquid nitrogen price keeps fluctuating, and a small can will require 10 litres which will last for 2 weeks; High costs of transportation and sanitization; When it's hot, we tend to have less cases of insemination ; Technical labor shortage; Competition for nitrogen facilities. Sometimes the Makerere University facility can break down and the one of Entebbe favors government hospitals; Additional services like synchronization. It's still low because we deal with small farmers. The hormones are also expensive a bottle costing 200,000 UGX.

Wastewater Management: David and Shirtliff supply water related equipment and installation like the water pumps, boreholes, solar water pumps, irrigation, swimming pool and wastewater management. **Barriers to scale:** Taxes (Solar panels and batteries are not taxed but pumps have an 18%VAT so it makes it expensive); Lack of information as the client can't provide it all so need to pilot the area which is expensive; Competition because companies are coming up where some have left the entity, and they try to do their work like us.

Prioritization of supporting enterprises in the dairy value chain

Priority must be given to enterprises that provide the following technologies since various actors had high interest to invest in them in the shorter term (1-3 years).

- Farmers
  - Artificial insemination of improved breeds
  - High yield forages
  - Precision feeding, concentrate feeds and toxin binders
  - Water harvesting systems
  - PV/Solar energy
  - Biodigesters
  - Agri fintech
  - Solar milk coolers (Small)
- Aggregators
  - Full solar electrification at the MCCs
  - Solar powered coolers
  - Refrigerated trucks
- Processors
  - Wastewater treatment
  - Recyclable packaging
  - Energy efficient equipment
- Traders
  - Digital record keeping systems
  - Electrified motor bikes
  - Recyclable packaging
  - Full solar electrification at MCCs and milk outlets
  - Solar powered coolers

PADNET Implications

- The pricing for end-consumer products by supporting enterprises is affected by the availability and cost of essential raw materials or inputs required for manufacturing and distribution. These raw materials are imported and not locally made. Import levy is for renewable energy products but not spare parts. There's is need for better import products for these products and spare parts.
- There is need for capacity building for technicians for proper maintenance and servicing of the technologies e.g. solar systems, biodigesters. Proper regulation of the sector is needed to prevent poor quality products on the market.
- The lack of awareness of various technologies by farmers, aggregators and processors calls for enterprises that aim to assist a widely dispersed customer base to allocate resources toward establishing sales and distribution channels or forming strategic partnerships. Additionally, they should offer after-sales support to ensure the continued utilization of their products or services and maximize the benefits for their customers.
- Obtaining affordable financing with favorable terms is a pivotal factor for scaling enterprises, particularly when dealing with substantial upfront costs. This financing is essential to address various needs, including working capital to cover payment gaps and offer upstream funding, and CAPEX for expanding production and operations
- Subsidies and tax incentives are essential and can stimulate the adoption of technologies by enhancing their affordability.
- Enhancing the conducive business environment through the implementation of investor-friendly policies, which involve reducing investment obstacles, streamlining approval procedures, and providing legal and financial safeguards, is vital in promoting the expansion of regional enterprises into Uganda.

Agenda

- Dairy sector overview
- Productivity & climate solutions
- Supporting enterprises
- **Access to finance**
- Government's role in enabling sector transformation

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Access to finance

- Less than 10% of dairy farmers have access to the financing facilities from the government and the private commercial banks.
- Dairy farmers access finance through Savings and Credit Cooperative Organizations (SACCOs), but the level of financing (loans, insurance and advice) is still low mainly due to supply and demand inadequacies
- Dairy farmers develop apathy and lack interest to obtain credit from commercial banks due to
  - Limited information available
  - Lack of required collateral security
  - Informal dairy farming management practices
- Financial institutions lack attractive financial products for dairy farmers due to speculative and volatile nature of agricultural enterprises

(SOURCE: https://www.independent.co.ug/financial-support-missing-in-thriving-uganda-dairy-sector/%E2%80%8B)

Access to finance (Survey findings)

- Farmers obtain loans from SACCOs because the requirements needed are milk produced and being a member of the cooperative.
- Cooperatives primarily opt to borrow from microfinance institutions rather than commercial banks due to the more favorable terms, including lower interest rates, and the ease of accessibility, thanks to the simplified requirements for obtaining loans.
- Cooperatives highlight that farmers who obtain loans from FOSAs/SACCOs primarily allocate the funds towards covering educational expenses and medical bills, rather than utilizing them for investments in milk production. This preference arises from the inadequate prices they receive for their milk, which deters them from making investments to enhance milk production, such as acquiring milk cans.
- Certain cooperatives serve as guarantors for large farmers, enabling them to secure loans from commercial banks or micro-finance institutions.
- Milk traders assert that financial institutions lack suitable offerings for them to access funding. They argue that these institutions are unaware of the worth of cooling tanks, insulated trucks, and other dairy equipment crucial to their business, despite the potential for using these assets as collateral for loans.

Opportunities and constraints of access to finance in Uganda (I)

- The Agricultural Credit Facility from the Bank of Uganda available to provide medium- and long-term loans through financial institutions (at a maximum of 10% interest per annum). However, it is open to commercial banks only, whose uptake is very limited, especially for dairy farming, (aversion to agricultural risks)
- SACCOs cannot access this facility directly, an avenue exist to use them to attract the needed investment to contribute to agricultural transformation in Uganda
- An opportunity exist to task commercial banks to manage the process with the SACCOs under an agency arrangement, thus providing SACCOs with access to additional credit

Source: https://www.independent.co.ug/financial-support-missing-in-thriving-uganda-dairy-sector/%E2%80%8B

Opportunities and constraints of access to finance in Uganda (II)

Uganda Development Bank (UDB)

- In the past, the bank has supported actors in the dairy value chain including dairy farmers (through cooperative societies) and dairy processors (purchase of new machinery/equipment)
- The interest rate charged for loans by the bank are highly subsidized (10- 12%) which farmers pay even when they borrow through cooperative societies.
- The bank has a climate finance facility *(UDB brochure, n.d)* specifically created to mobilise capital from both domestic and external sources targeting both private and public entities and directed towards low carbon and resilient investments.

Challenges faced by the banks while assessing loans

- Climate change related occurrences such as disease outbreaks and droughts which occasionally undermines the ability of borrowers to repay their loans,
- In the dairy industry, milk marketing is largely informal,
- Unreliability of dairy markets: During the glut season, milk processors (who sometimes acts as cartels) fail to accept all milk deliveries by farmers and or pay low prices
- Lack of recognised breeders who can guarantee the price and quality of animals purchased using financing by the bank,
- Non-tariff barriers in the livestock and livestock commodities trade between Uganda and other/neighbouring countries
- High level of illiteracy among farmers

Examples of access to finance in the Dairy sector

The Ntungamo Dairy Farmers' Union

- When investing in the cooling facilities at the Union bulking centre. They were supported by aBi who paid half of the costs of the cooling facility and the farmers paid for the half.
- They got a loan from a microfinance called Pride microfinance at a rate of 25%. This rate was so high that farmers could not afford it.
- SNV helped to pay half of the interest and the farmers paid the rest.
- The Union mentions that they are aware of Uganda Development Bank loans, but it is a recent credit facility. However, getting these loans is a bit hard.
- Farmers borrow money from the SACCOs for things like school fees, medical bills and not to increase production in their farms.
-

Biogas solutions Uganda

- Biogas solutions is an enterprise that supports installing biodigesters for biogas.
- They initially gave SACCOs interest free loans such that they give their members loans to adopt the biodigesters.
- They signed an MOU with SACCOs to give members loans at an interest of 18% from 36% that was the ongoing interest rate.
- However, there were high default rates of 24%. The SACCOs had to be reminded all the time to ask the members to pay back the loans yet they had adopted the technology
- The SACCOs did not understand the biogas technology and thus did not follow up on how farmers were using them.
- On a positive note, 300$ on fuel was saved, crop yield increased by 30% because of use of the bio slurry.

Access to Finance for Companies (Examples) in Uganda

Actor	Solar financing projects
Government	•The Government has launched the Energy Access Scale-up Project (EASP) with the World Bank Is implemented by Ministry of Energy and Mineral Development (MEMD) and Uganda Energy Credit Capitalization Company (UECCC) with Productive use of renewable energy (PURE) as one of the key areas of focus. •The Micro-irrigation scheme under the Uganda Intergovernmental Fiscal Transfers Program Project for Uganda (UGIFT) has supported several Solar Powered Irrigation companies to reach farmers.
Donors (Grants and RBFs)	•GIZ EnDev has developed results-based financing (RBF) schemes supporting the market-based expansion of Productive use of renewable energy (PURE), with a focus on solar water pumping for agriculture. CLASP has recently launched a PURE RBF (with support from GEAPP in several countries including Uganda). •The Beyond the Grid Fund for Africa (BGFA) has launched its second financing window in Uganda, with Productive use of renewable energy (PURE) as one of the target areas. • The Universal Energy Facility has launched, targeting Productive use of renewable energy (PURE) and mini-grids
Debt	•Impact debt financers like SIMA have the Energy Access Relief fund which continues to provide debt to companies including Productive use of renewable energy (PURE) companies
Investors	•Angel investors, impact investors and venture capitalists and impact investors are increasingly taking an interest in Productive use of renewable energy (PURE) in Uganda. These include Frontier Energy Fund, Renewable Energy Challenge Fund, Climate Investor One, Solar Energy Foundation, Solar Aid, etc.

Source: Centre for Research in Energy and Energy Conservation (CREEC), GOGLA and Ugandan Solar Energy Association (USEA)2023: Uganda Productive Use of Renewable Energy Market

Productive use of renewable energy technology financing available to consumers in Uganda

PAYGo Finance	•Pay-as-you-go (PAYGo) consumer financing allows customers to pay for a Productive use of renewable energy (PURE) product in instalments over time, until they own it outright. Usually, PAYGo asset providers also require an initial downpayment for the product at the time or sale
Loans	•Equi-Green loans launched by Equity Bank can be used to buy Productive use of renewable energy (PURE) assets • MoUs between Productive use of renewable energy (PURE) technology companies and FIs to provide consumer financing e.g., Solar Today and Rwanyamahembe SACCO to supply solar coolers to farmers
End-user subsidies	• Government initiatives have been launched such as the Micro-irrigation scheme which provides up to 75% of the cost price of a Solar Powered Irrigation System (SPIS)., with the purchaser paying the remaining 25%. • Appliance financing schemes including in mini-grid schemes e.g., the scheme run in the mini-grid villages operated by Winch in Lamwo with support from GIZ where part of the appliance cost is subsidized, and the rest is paid by the customer.
Own financing	•Investing business earnings to attain Productive use of renewable energy (PURE) e.g., farmers using earnings or savings to purchase solar water pumps.

Source: Centre for Research in Energy and Energy Conservation (CREEC), GOGLA and Ugandan Solar Energy Association (USEA)2023: Uganda Productive Use of Renewable Energy Market Assessment:

PADNET Implications

- Implement risk-sharing mechanisms, such as loan guarantees or insurance products, to reduce the perceived risk for financial institutions, making them more willing to offer affordable loans.
- The government can support in access to finance in the dairy sector through providing subsidies and grants to dairy farmers, aggregators, traders and processors to reduce their borrowing costs.
- The government can also implement interest rate caps to ensure that dairy sector borrowers have access to affordable interest rates.
- Establish specialized financing programs dedicated to the dairy sector to provide loans with lower interest rates and longer repayment terms tailored to the specific needs of dairy farmers and other actors.
- Collaborative initiatives with financial institutions and dairy sector associations like traders' associations, farmers union, processors associations to create tailored financial products for the dairy sector. Encourage public-private partnerships to increase the availability of affordable credit to dairy stakeholders.
- Establish databases and information-sharing platforms that track the financial performance of dairy sector stakeholders. This data can help lenders assess creditworthiness more accurately.
- Educate dairy sector stakeholders about the available financing options, support programs, and how to access them.

Agenda

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- Government's role in enabling sector transformation

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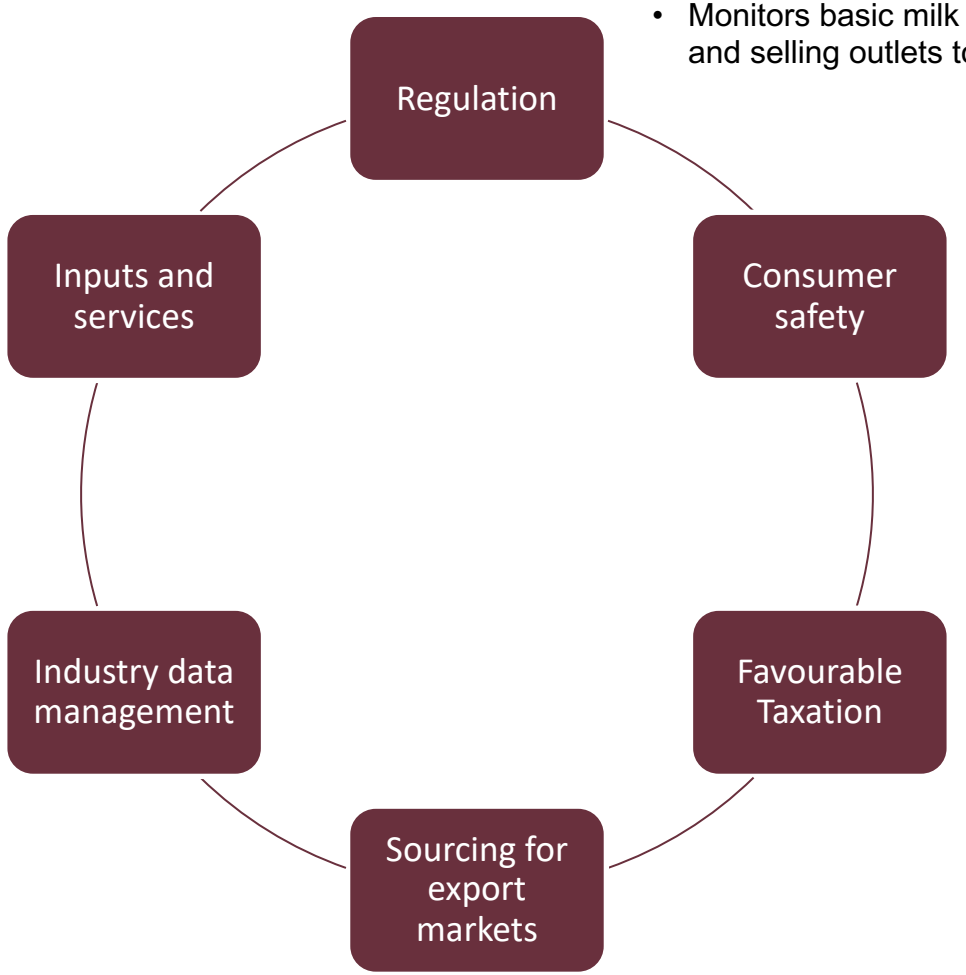
Government's role in enabling sector transformation

- Helps to develop and regulate the Dairy sector
- Monitors basic milk quality tests on raw milk delivered to MCCs and selling outlets to carry

- Supports farmers with improved productivity enhancing technologies (nutrition, genetics and animal health)
- Supports farmers with inputs and services for improved dairy management



- Regulates milk handling and safety to ensure milk and milk products are fit for human consumption.
- Sets up infrastructure for frequent analysis and testing of milk and milk products to ensure they are fit for human consumption
- Ensures constant enforcement of dairy standards in line with the dairy regulations and other related food laws

- Lower levies/fees charges for companies registering to export dairy products

Government's interventions to grow the milk processing sector

- Lower fees charges for companies registering to export dairy products (Ugx. 200,000) in contrast with higher fees paid by companies applying to import dairy products into Uganda (Ugx 2 million).
- Active export market search for dairy products by the government on behalf of dairy processors. Paying dividends as evidenced by the recent government to government agreement between Uganda and Algeria for export of dairy products. Similar initiatives are underway involving Uganda and the governments of China, Turkey, Senegal, Zambia, and DR Congo
- Offering trainings on value addition by DDA through the Dairy Training Institute, including incubation of milk processing businesses.
- Availing of small processing plants through the NAADS program
- Ensuring a tax regime that is conducive for business for dairy processors. For instance, milk processors have not been paying cess.

Responsibilities of the Dairy Development Authority (DDA)

- Registers and licenses milk processors and traders
- Supports dairy farmers' marketing organizations
- Advises the government on milk standards and coordinates the enforcement of those standards in liaison with the Uganda National Bureau of Standards
- Controls and regulates dairy and dairy-related import and export activities in conformity with the External Trade Act, but without violating the Animal Diseases Act
- Implements Government policy designed to promote the development of the dairy sector
- Supports various dairy development activities such as dairy extension, dairy breeding, dairy research, dairy training, dairy products development and general market promotion, including promotion of dairy export(s)
- Acts as arbitrator in any conflict between dairy companies and processors
- Coordinates all dairy processing and marketing promotional activities, such as seminars, trade fairs and workshops
- Consolidates dairy processing and marketing data
- Advises the Government on research priorities of the dairy subsector and does anything connected with, or necessary for the performance of the foregoing duties

Data and digitization of records and information

- Digitization of records by milk collectors at national level is yet to happen although innovations that can be used are available with private sector e.g.
  - Ezy Agric is an agtech company that integrates ICT in the delivery of production and marketing services to farmers,
  - Jaguza Livestock App that can create livestock datasets for a range of applications
  - EMATA that has capabilities for digital and affordable financial products to farmers in East Africa.
- Challenges to digitization include poor internet coverage in areas where milk is produced, low digital literacy, and lack of a strong policy on digitization.
- No data is available on consumption and production projections, but analysis is in progress under a project that is working on a dairy master plan for Uganda.

Regulations to ensure growth of the processing sector

Dairy Policy Action plan:

- The objective of the Dairy Policy Action Plan (DPAP) is to guide policy, planning and investment decisions that will enhance the performance of Uganda's dairy value chain, in alignment with the Agro-Industrialisation Programme, the third National Development Plan (NDP III) and the DDA's five- year Strategic Plan.
- It spells out the priority areas: https://dda.go.ug/assets/files/Uganda_Dairy-PolicyActionPlan2022.pdf

Challenges in regulation of the dairy industry

- Inadequate funding and staff to carry our inspections and enforce regulations - e.g., the authority was unable to conduct activities lineup in the current year due to lack of funds. Partly due to
  - There is a court injunction on levy collection, and this frustrated the Authority's effort to mobilize revenues close to UGX 14 billion
  - Cess suspension and non-compensation of Cess amounting to approximately UGX16 billion annually
- Farmers continue to use inappropriate milk containers because the authority lacking capacity to ensure or enforce use of proper milk containers.
- There are no regional laboratories that can support inspection services and make quick decisions.
- The National laboratory lacks equipment and reagents needed to performance some analyses hence samples are taken to Nairobi for analysis. Reduces efficiency of regulation.
- A poor culture of self-regulation among the local dairy value chain actors

PADNET implications

- The government should continue investing in cold chain infrastructure actively investing in the rehabilitation of dilapidated milk collection centers in the different milk sheds.
- The government should remove the import levy on some milk equipment like the milk cans to reduce the cost of these cans and increase access to them. For those cans locally made, the government should regulate the market to ensure good quality milk cans produced.
- Develop enduring demand destinations for processed dairy that promote sustainability through nutrition awareness campaigns, public ,consumption awareness, subsidies allocated to consumers to support their financial needs.
- The government should continue to train and certify milk traders to ensure milk quality and proper milk handling for safety of the consumers.
- Regulation of the informal milk channel to ensure milk quality and safety.
- Improve the data infrastructure through investments in a data commons and internet access to enhance sector comprehension, guide informed stakeholder initiatives, and enable optimal decision-making.
- The government should enable access to extension services by the dairy farmers to ensure improved milk production.
- Development of infrastructure e.g. the roads, access to electricity in the rural areas where milk production is based.
- There are import tax exemptions on all renewable energy technologies but there is need to Implement specific government incentive programs to enhance the affordability of climate-smart technologies throughout the dairy value chain, facilitating quicker adoption.

Sections of the report will be refined and strengthened

- **FAE models to drive on-farm adoption of productivity and climate solutions – we will add slides on**
  - Potential impact of transformation / increase in productivity on total emissions and emission intensity
  - CS interventions that can be adopted by different typologies of farmers and other actors,
  - Opportunity offered by FAEs in the scaling of the identified interventions
  - Common barriers to scaling farmer allied models
  - Implications to PADNET on scaling up farmer-allied models
- **Post farm-gate adoption of climate-smart inputs and technologies**
  - We will partition this section into subsections for aggregators, processors & traders (slides already there)
  - In each subsection, we add a documentation of CSI & T that could impact on productivity, adaption and mitigation
  - Add an analysis of barriers of adoption of climate smart technologies
  - For each subsection include a slide on PADNET implications
- **Prioritization of supporting enterprises for scale-up**
  - Make a documentation of inputs and technologies that can enhance productivity, adaptation and mitigation at different nodes in the VC
  - Apply the 4-step approach : (i) determine lead sector and filter out solutions led by government; (ii) Assess current origin of the solutions and filter out the imported solutions (usually MNC-driven); (iii) Assess each of the enterprise types that engage in local/regional production or service provision based on impact and growth potential, and do an evaluation of barriers to scaling of priority supporting enterprises
  - We will present more case studies of the enterprises we studied
  - We will include a slide on PADNET implications
- **Access to Finance**
  - We will add a slide on public financing

Surveyed respondents: Traders

1st classification	2nd classification	Name	Date
Traders	Large scale trader, aggregator and transporter	Abesiga Mukama	21/09/2023
	Medium scale trader, aggregator and transporter	God's grace	21/09/2023
	Medium scale trader	Family Dairies	21/09/2023
	Small scale trader of processed milk by boiling	Kyaterekera dairies	21/09/2023
	Farmer and small-scale trader	Emburara dairies	27/09/2023
	Large scale trader, aggregator and transporter	Sibyangu dairies limited branch Kiboga	29/09/2023

Surveyed respondents: Processors

1st classification	2nd classification	Name	Date
Processor	Large scale processor	GBK ltd	26/09/2023
	Large scale processor	Lakeside dairy Ug ltd	26/09/2023
	Large scale processor	Brookside/fresh dairy	25/09/2023
	Large scale processor	Rainbow Dairy	22/09/2023
	Large scale processor	Kooke enterprise	28/09/2023
	Small scale processor	Mackyies ltd	25/09/2023
	Small scale processor	Narka dairies	25/09/2023
	Small scale processor	Greenland dairies ltd	25/09/2023
	Small scale processor	REAL ltd	25/09/2023
	Small scale processor	Jublin farm dairies	27/09/2023
	Small scale processor	Hola Fresh milk	22/09/2023

Surveyed respondents: Supporting enterprises

1st classification	2nd classification	Name	Date
Supporting enterprises	Solar providers	Solar today	26/09/2023
	Pasture seed	U farm	26/09/2023
	Energy efficient processing equipment and processor	Indigo/Hola Fresh milk	27/09/2023
	Trainer of dairy farmers in climate resilience	Mutanoga based in Rushere	27/09/2023
	Pasture seed	Syova	25/09/2023
	Dairy farming equipment supplier	Snowman	25/09/2023
	Artificial Insemination	Worldwide sires	26/09/2023
	Dairy feed concentrates	Tunga	28/09/2023
	Solar milk coolers	Wamala energies	27/09/2023
	Water and energy	Davis and Shirtliff	28/09/2023
	Waste recycling and Large processor	FIDO FIDO Industries	28/09/2023

Surveyed respondents: Cooperative

1st classification	2nd classification	Name	Date
Cooperatives		Abesigana Dairies farmers' Cooperative society	26/09/2023
		Kashaka Dairy farmers cooperative society	27/09/2023
		Nyamitsingo Dairy cooperative society	27/09/2023
		Ddwaniro Dairy and livestock farmer coop society	29/09/2023
		Kiboga livestock farmer coop society	29/09/2023

Surveyed respondents: NGOs, Bank and government agencies

1st classification	2nd classification	Name	Date
Regulatory bodies		Dairy Development Authority (DDA)	28/09/2023
		Ministry. Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	26/9/2023
Financial institution		Uganda Development Bank (UDB)	27/09/2023
Development organizations		SNV - Netherlands Development Organisation	28/09/2023
		Heifer International	27/09/2023
		ABi Trust	27/09/2023
Other stakeholders		United Nations Capital Development Fund (UNCDF)	10/10/2023
		Uganda National Dairy Traders Association	6/10/2023
		Ministry of Energy	6/10/2023
		Ntungamo Dairy Farmers' Union	12/10/2023
		Uganda Clean Energy Association	6/10/2023
		National Alliances of Agriculture Cooperatives in Uganda	7/10/2023

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