



## **The Dairy Value Chain in Uganda**

**A report by TechnoServe Uganda for the  
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## EXECUTIVE SUMMARY

Dairy is an important contributor to Uganda's agriculture GDP, accounting for an estimated 9% of total agriculture GDP (and about 3% of total GDP). While official statistics are often inaccurate or simply non-existent (in the case of the informal sector), we have estimated annual milk production in Uganda at 1 billion litres. It is worth noting that consumption of milk in Uganda is relatively low, less than 25 litres per person p.a.

Although exotic/cross breed cattle constitutes less than 20% of the cattle population, in 2007 these breeds produced around ~60% of all milk in Uganda. And it is thanks to the high number of exotic/cross breed cattle that the Western region leads in terms of production.

Farmers in Uganda engage in open, semi and zero-grazing methods. Semi-grazing and open range are less labor and investment intensive, but normally produce lower yields. In the case of open grazing in Uganda, the yields can be as low as 1-2 liters per day per cow, with semi-grazing yields varying from an average of 5 to 20 liters per day per cow, whereas with zero-grazing yields can go up to 30 liters. It is important to note that farmers using semi-grazing production methods must own at least ten cows to break the \$1 poverty line, and farmers engaged in free-range production need at least 20, yet most households actually have less than 5 cows.

Most milk in Uganda is sold in the informal market; formal channel distribution accounts for an estimated 9% of production (and Uganda is currently utilizing only 29% of its installed processing capacity). Losses are also high; in 2007 losses accounted for about 10% of total production (implying a value of over US\$23mm).

Looking at the dairy value chain in Uganda, it is important to note that, while prices vary between the formal and informal sector, in general farmers will receive a higher price from informal buyers. This has implications for EADD and the chilling plants (CPs), as each CP will have to assess pricing in its micro-market and develop strategies accordingly.

For simple products (such as pouch milk), farmers capture around 1/3 of the profits. In the case of higher value-added products (e.g. UHT TetraBrick), processors capture more than half of the profits.

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## LIST OF ABBREVIATIONS

CAGR	Compound Annual Growth Rate
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
UHT	Ultra-High Temperature processing
USh	Uganda Shillings

## INTRODUCTION

The East Africa Dairy Development (EADD) project commissioned this study to provide information on the chain of players involved in the dairy industry in Uganda, from the producers, or farmers, to the end consumers of dairy products, referred to as the dairy value chain. This study seeks to inform the public about the economics and challenges facing each segment of the value chain and ultimately identify opportunities to increase farmers' income and/or expand the dairy industry.

The vision of EADD is to “move smallholder farmers out of poverty by delivering farmer-focused, value-chain activities that are implemented simultaneously. These activities will stimulate dairy farm production, dairy-sector services, business development and dairy market pull. Developing technically trained, business-savvy farmers and services providers will generate success and sustainability. Research and documentation of effects, outcomes and lessons will inform decision-making as this project develops and will identify future opportunities for effective interventions in the dairy value chain. The project will deliver direct economic benefit to rural dairy households—the common vision of the implementing partners.”<sup>1</sup>

## OVERALL ECONOMIC PERFORMANCE

Uganda has a population of 31 million, of which 38% live below the poverty line<sup>2</sup>. It is a very young population, with 50% in the 0-14 years age bracket<sup>3</sup>, and unsurprisingly, a high population growth rate of 3.6% p.a. Most of the population is classified as agricultural self-employment.

“Since 1986, the government - with the support of foreign countries and international agencies - has acted to rehabilitate and stabilize the economy by undertaking currency reform, raising producer prices on export crops, increasing prices of petroleum products, and improving civil service wages. The policy changes are especially aimed at dampening inflation and boosting production and export earnings.

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<sup>1</sup> EADD Grant Proposal – Summary Information for Submission of August 30, 2007

<sup>2</sup> World Bank, *Uganda at a glance*, September 2008

<sup>3</sup> CIA World Factbook

During 1990-2001, the economy turned in a solid performance based on continued investment in the rehabilitation of infrastructure, improved incentives for production and exports, reduced inflation, gradually improved domestic security, and the return of exiled Indian-Ugandan entrepreneurs<sup>4</sup>.

GDP in 2007 was \$11.2 billion, with an average annual growth of 6.5% (compared to 5.1% for 2006). According to the recent Budget Speech delivered to Parliament, the growth for 2007/2008 was actually significantly higher, around 8.9%<sup>5</sup>. This growth was fuelled by improved prices for export products such as coffee, fish, and tea. In fact, Uganda expects export earnings in 2008/09 to increase by 15% compared to the previous period (\$2.3 billion, up from \$2 billion).

## DAIRY SECTOR: PRODUCTION

Agriculture is an important sector of the Ugandan economy, constituting about 32% of GDP. 70% of population is classified as agricultural self-employment.<sup>6</sup> Out of the 3.8 million households, about a third (1.2 million)<sup>7</sup> own cattle and are therefore potentially involved in the dairy industry.<sup>8</sup> Within agriculture, dairy plays an important role as a contributor to GDP with an estimated 9% of total agriculture stake (about 3% of total GDP)<sup>9</sup>. Estimating the size of the dairy industry, however, is a challenge. Most of the sector is informal, and official statistics, if non-accurate for the formal channel, are simply non-existent for the informal one.

In fact, almost all Ugandan dairy statistics are estimates. The last cattle census was conducted in 2002. The current official cattle population statistics come from the Minister of Agriculture, Animal Industry and Fisheries. A new census is expected to

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<sup>4</sup> Ibid.

<sup>5</sup> Budget Speech Financial Year 2008/09, delivered on June 12, 2008 by the Minister of Finance, Planning, and Economic Development

<sup>6</sup> Ugandan Ministry of Finance, *Planning and Economic Development, Background to the Budget 2007/08 Fiscal Year*, 2008

<sup>7</sup> Ugandan Bureau of Statistics, *Population and Household Census*, 2008

<sup>8</sup> No estimates are available on number of household actively involved in the dairy industry. However, it is reasonable to assume that the vast majority of cattle owners milk their cows

<sup>9</sup> Dairy Development Authority, *Overview of the Status of Uganda's Dairy Industry*, 2008

be completed by the end of next year. The official statistics place the number of milking cattle at about 7.5 million, of which about 6.3 million are indigenous and 1.2 million exotics and cross-breeds.<sup>10</sup> The Food Agricultural Organization reports a total number of 7.2 million cattle, with no breakdown between indigenous and non-indigenous.<sup>11</sup>

If estimates in cattle population are relatively homogeneous, estimates in milk production are in strong disagreement. Specifically, the Ugandan Minister of Agriculture based on the Dairy Development Authority's estimate places Ugandan milk production for 2007 at more than 1.5 billion liters, whereas FAO's estimate is half of that number (about 750 thousand liters).<sup>12 13</sup>

There are numerous problems with establishing milk production and size of the Ugandan market. In the first place only a fraction of the production is processed and enters the formal sector, on which official statistics are based. In the second place, statistics on the formal sector are limited. Players in the sector tend to keep a very secretive attitude which makes it very hard to come up with very basic figures (ie. size of formal market). In the third place, data officially available are scarcely reliable. For instance, imports official data (about \$ 6 million) is clearly wrong. In fact, evidence from independent market research shows that the actual data must be 2-3 times bigger.

In the light of such major differences, we decided to investigate methodologies used to assess milk production. As a result, a new more-refined methodology was developed, resulting in a production estimate of 1.028 million liters. Both the methodology and estimate were developed by interviewing industry experts<sup>14</sup> and under the constant supervision and support of Dr. David Balikowa. The proposed methodology utilizes the same formula upon which the Minister of Agriculture /Dairy Development Authority's estimate is based, namely

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<sup>10</sup> Ugandan of Bureau of Statistics, 2008

<sup>11</sup> FAOStat.com

<sup>12</sup> Dairy Development Authority, 2008

<sup>13</sup> FAOstat.com

<sup>14</sup> Telephone interview with Dr. Steve Staal, two meetings with Dairy Development Authority staff

$$\text{Total production} = \# \text{ of cattle} * a * b * c * d * e$$

whereby

a = % adults over total population

b = % female over total adult population

c = % calving over female adult population

d = Period of Lactation (days)

e = Average Yield per cow (liters/day).

This formula used to be applied for the whole country. Yet, Uganda offers quite different environments in terms of milk production, also, but not only, in the light of different concentration of high-yield cattle (exotics and cross-breeds). Thus, four main regions were identified (South-Western, Central, Eastern and Northern) and assumptions were made separately for each region (both for indigenous and exotic/cross-breed cattle). More details on methodology and assumptions are to be found in Annex 1.

Notwithstanding imprecision in statistics and assessment, it can definitely be stated that milk productivity<sup>15</sup> in Uganda has increased in the past five years. In fact, if cattle population went from 6.3 to 7.5 million units between 2002 to 2007 (which results in a compounded average growth rate – CAGR - of +4.6%), milk production went from 625 million to our 1.0 billion liter estimate (CAGR of 13.4%). The increasing size of the exotic/cross-breed population was a major contributor to such a trend. In 2002, exotic/cross-breeds only accounted for 8% of the total population, contributing to total milk production of 28%. In 2007, the percentage of non-indigenous cattle was 17%, contributing to total milk production of over 58%. Yet it is very hard to compare such figures with international benchmarks. In fact, Ugandan productivity ranks among the lowest in the world, allegedly performing much worse than Kenya (slightly more than 500 liters per cow in Uganda versus more than 1,000 liters per cattle in Kenya) and Rwanda (500 vs. 700). Needless to say, countries such as the United States, Argentina and New Zealand have productivity ratios from 18 to 7 times higher. The reason for such a difference is twofold

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<sup>15</sup> Productivity = total milk produced in a year / total number of cattle

- Poor and inadequate feeding. Most cows produce well below their potential because their nutrient intake is insufficient in both quantity and quality. Most smallholders feed their cows by letting them openly graze, mostly on common land, by the side of the road. This does not provide cows with a sufficient quantity of food. Grazing is not normally supplemented by feeds, depriving cows of required level of proteins and minerals. The main reason for not using commercially or home-made feeds is their high cost. Also, farmers often complain that the quality of commercial feeds varies, and is inconsistent. At the same time, some ingredients to make home-made feeds, such as cotton seed cake are not locally produced, and occasional shortages can increase the cost of production.
- Poor breeding practices. The bulk of Uganda's dairy herd has a relatively low genetic base due to years of inbreeding and the use of unproven bulls.

If poor breeding and poor farming techniques may justify a low productivity ratio, it is somewhat surprising that Uganda does much worse than Kenya and Rwanda. One possible explanation relies on the denominator used in the productivity equation. It is likely that a certain percentage of Ugandan cattle (from 10% to 30%, depending on sources) is not involved in the dairy industry and thus should not be taken into account in the productivity calculation. However, no official statistics on such metrics are available and any estimates would further skew the output of this analysis.

Most of the dairy production is concentrated in the South-Western (47% ca) and Central region (23%). The Eastern and Northern regions account for 18% and 11% of the total, respectively<sup>16</sup>. Cattle concentration, however, does not follow the same pattern. In fact, significant cattle presence can be found not only in the Western (31% ca) and in the Central region (29% ca), but also in the Eastern (about 23%) and in the Northern region (18% ca). The difference in productivity is thus explained by a different breakdown of type of cattle. Not surprisingly, most high-yield exotic-cross

<sup>16</sup> EADD will concentrate its activities in the Central region

breed cattle are actually concentrated in the South-Western region (70% ca). The difference in productivity among different Ugandan regions is therefore mainly due to two factors:

- **Diseases:** Eastern and Northern regions are more hit by cattle diseases such as Trypanosomosis and East Coast Fever that are very dangerous for cross-bred cattle
- **Demand:** In the Eastern and Northern regions, consumption of milk is much lower than in Central and South-Western regions

It is important to note that climatic factors and access to extended services are not differentiating factors in explaining milk production differences across the country.<sup>17</sup>

Almost all Ugandan production goes to satisfy local demand. Exports are low (\$ 1 million ca.). However, data show a significant increase in exports, thanks to Fresh Dairy's turnaround operated by Sameer group. It is likely that this trend will continue and that Uganda will strengthen its exports in the dairy sector (particularly in milk powder, a product that it is particularly apt to be exported and. Fresh Dairy has invested a significant amount of money to produce powdered milk). However, Uganda is a net importer of dairy products. Even if official data<sup>18</sup> only set imports at less than \$6 million in 2007, our estimates assess them to be about \$ 20 million in the same year. Such a huge difference is mainly caused by the practice of non-declared imported dairy products (in particular milk powder) put in place by importers to avoid import taxes.

## DAIRY SECTOR: CONSUMPTION

In order to assess the market size of the dairy industry in Uganda, we adopted a combined top-down/ bottom-up approach in this analysis. In fact, official figures available on milk consumption seemed from the beginning wrong and driven by the same overstating attitude that led to the 1.5 billion liter estimate. The approach unfolded along the following steps:

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<sup>17</sup> Source: Telephone interview with S. J. Staal, S. J. Staal and W. N. Kaguongo, The Ugandan Dairy Sub-sector Targeting Development Opportunities, International Food Policy Research Institute, 2002

<sup>18</sup> Source: Uganda Revenue Authority, 2008

- **Non-marketed milk vs. marketed milk** (Ugandan production): consensus both in literature and among industry experts that the volume of milk that does not reach the market (out of total Ugandan production) is 30%.<sup>19</sup> For lack of better sources, in this analysis it is therefore assumed that marketed milk is 70% of total production (700 million liters ca.).
- **Informal vs. formal milk (Ugandan production):** Formal milk is defined as milk processed by a registered processor (15 in Uganda). However, most milk is marketed through the informal channel. Official data on the quantity of milk processed by milk processors determined the breakdown in this category.<sup>20</sup>
- **Value of marketed milk vs. value of consumed milk:** Consumed milk also includes imported milk. The starting point of this further breakdown was a value quantification of both informal and formal milk. The informal market value assessment was simple. No imported milk is sold through the informal channel and thus the only assumption to be made concerns the average price of milk at the informal level. Taking in account strong differences in informal milk prices (ranging from 550 US\$ to 1,000 US\$), a conservative 650 US\$ price was used. The formal market was assessed in value through industry expert interviews and independent research. Then, assuming an average market value of 1,650 US\$ per liter ( \$1 per liter), the value of imports was calculated (volume of consumed milk less the volume of consumed milk produced in Uganda).

The results of this approach are summarized below:

#### **Volume of milk production in Uganda** (2008, million liters)

- Total non- marketed milk = 318
- Total marketed milk = 741

of which:

<sup>19</sup> Non marketed milk includes milk used for farm consumption (family consumption, cattle feeding) and losses

<sup>20</sup> Of total processed milk, ~70% is processed by FreshDairy, the incumbent in the Ugandan dairy sector. FreshDairy's processing capacity accounts for ~65% of Ugandan processing capacity. Average capacity utilization in Ugandan is below 30%.

- Informal market = 674
- Formal market = 67 (~ 66 for internal market, ~1 for exports)

**Value of milk consumption in Uganda (2008, million \$)**

- Informal market = 265
- Formal market = 83

of which:

- Local milk = 66
- Imports = 16

**Volume of milk consumption in Uganda (2008, million liters)**

- Informal market = 674
- Formal market - local = 66
- Formal - imports = 16

of which:

- Local milk = 67
- Imports = 15

In terms of milk consumption per capita, Uganda lags significantly behind internationally recommended norms, with an estimated annual consumption per capita of 25l (the World Health Organization recommends 200l per year).

In the informal market, which accounts for 75% of the total value of the Ugandan dairy industry, only Ugandan milk is sold. In the formal market, though, imports account for ~20% of total value (most of which is milk powder). The most important Ugandan processor is FreshDairy which controls more than 30% of the total formal market (in value terms). More than 75% of the market is composed of milk powder (~40%), pasteurized milk (~25%) and UHT milk (~10%). The remainder is composed of butter, cheese, yoghurt and ice-cream.

**DAIRY VALUE CHAIN**

*Overview*

The value chain of both the formal and informal market is fragmented with a large number of players at each step, and a low level of vertical integration, with some rare exceptions (ie. small processors such as Jesa, White Nile, etc.). In the formal

value chain, the milk is first transported to primary collection centers and to chilling and bulking centers before being delivered to a processing facility. Once milk is processed, agents or distributors deliver it to a point of sale. The informal market connects producers to consumers normally via a number of hawkers/brokers. See Annex 3 and 4 for further details.

The main characteristics of the dairy value chain in Uganda are as follows: (i) prevalence of the informal sector, (ii) lack of critical mass and (iii) high variability of milk price at the farm gate.

(i) Even though the formal sector offers higher accountability and certainty of daily revenues, most milk is still sold in the informal market (despite efforts made by the formal sector). The preference for selling into the informal market is driven by higher prices, cash payments and lack of a required minimum scale. The informal sector (i.e. brokers) pays in cash on the spot, while processors usually pay after two weeks. Considering that milk is often the only recurrent revenue for farmers, the need for cash to cover daily expenses creates a strong preference for producers to sell to informal traders/hawkers. In addition, there is no quality control in the informal market allowing producers to sell poor quality milk that would be rejected by processors.

(ii) Milk can sit in primary collection centers for days before being transported to the bulking & chilling center because transporters need a minimum quantity of milk in order to make profit out of a trip. Such a problem, while still manageable in the wet season (up to two days), dramatically worsens in the dry season, during which milk can sit for up to four days in a primary collection centre. Lack of critical mass also affects processors. Most processors invested in processing capacities designed for wet season milk supplies. In the dry season, though, most of them face utilization ratios as low as 30%.<sup>21</sup>

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<sup>21</sup> The only exception is represented by Jesa which has a capacity utilization ratio of ~80%. Thanks to its integrated system, from farming to processing, Jesa is able to control production. In addition, its zero-grazing farming practices (unique large scale case in Uganda), make the impact of seasonality on milk production negligible.

(iii) Milk price at farm gate in Uganda is very sensitive to both seasonality (dry/wet season) and geographical area. For example, in nearby Jinja the dry season farm gate milk price can go up to 500 USh per liter, while in Rushere in the wet season a liter of milk costs about 250USh. Maintaining a market-driven price policy will be critical for the chilling plants, as well as understanding the range of sales options available to farmers in the micro-region supplying to the chilling plant.

### *Pricing*

Milk takes various routes from producers to the end consumer (See Annex 4). Because of wide fluctuations by season and particularities of individual locations, the price to the end consumer in the informal market can vary widely (from Ush 600 up to 1,000 per liter). The price to the end consumer in the formal market (1,200 USh, flat across regions and seasons), is thus from 20% to 50% higher than in the informal market.

This price differential is however somewhat misleading. When processed milk sold in a pouch pack is compared with the equivalent quantity of raw milk, taking into account seasonal price fluctuations and deficient serving sizes, the price differential is no longer that large. The price of raw milk fluctuates with the season, while the price of processed milk is stable throughout the year. During the wet season, when milk is abundant, a liter of raw milk can be purchased for 850 USh in Kampala. That makes it 30% cheaper than processed milk. However, during the dry season, the price increases to approximately 1,000 USh per liter, reducing the price differential to less than 20%. In addition, raw milk is often sold in containers of 500 ml that actually hold from 10% to 20% less than 500 ml. Considering that very often informal milk is watered down (informal milk does not get tested and up to 10% of water is impossible to detect without specific testers), the difference in price vanishes. If one also considers the severe health risks deriving from non-tested milk, pasteurized milk should be able to compete with informal milk (at least where prices are in the upper part of the range, such as in Kampala and Jinja's markets).

However, there are important drivers of consumer behavior that explain why informal milk still gets more than 90% of the market (volume-wise). Such factors have more to do with perception and consumer awareness and less with price:

- a number of consumer studies show taste preference for raw milk, perceived as creamier and richer;
- consumers don't know that boiling raw milk highly reduces its nutritional content
- consumers perceive processed milk as “non-natural” and not as healthy as raw milk

In general, the Ugandan market is very uneducated and consumers' purchasing decisions are based more on local myths and tradition than on rational factors (such as price per liter, nutritional content, health risks).

### *Production*

There are three types of dairy production, zero-grazing (intensive), semi-grazing (semi-intensive) and open range (extensive). Zero grazing involves confining cattle to a limited physical space where they are managed, fed, watered and milked. Open range involves free grazing by the cattle, often with no supplemental feeds. Semi-grazing falls somewhere in the middle and involves the combination of the two approaches. While zero-grazing requires higher investment in fixed infrastructure and closer management of cattle, it normally produces higher yields per cow. Semi-grazing and open range are less labor and investment intensive, but normally produce lower yields. In the case of zero-grazing in Uganda, the yields can be as low as 1-2 liters per day per cow, with semi-grazing yields varying from an average of 5 to 20 liters per day per cow, whereas with zero-grazing yields can go up to 30 liters.

For the purpose of this study a number of interviews were conducted with small (less than 5 cows), medium (up to 20 cows) and large size farmers (more than 20 cows) located in different parts of the country.<sup>22</sup> As the zero-grazing farming practice is rare to find in Uganda, the analysis is focused on free-range and semi-grazing farmers.

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<sup>22</sup> Namely in Mbarara, Rushere, Bosheny and Jinja area.

### *Free range*

The profit margin at farm level is reasonably high. For a medium size farmer (between 10 and 20 cows), the margin can reach 50%. Major costs are labour (~50%) and other costs such as water, depreciation (of both cows and cans) and vet treatments. Notwithstanding good margins, the low scale leaves most farmers below the poverty line.<sup>23</sup> Our sensitivity analysis shows that even with a 50% profit margin, a free range farmer needs about 25 cows to earn a daily income of 1 dollar a day (See Annex 5).<sup>24</sup>

### *Semi-grazing*

The profit margin for a medium size farmer (between 10 and 20 cows) is about 50%. Major costs are feeding/pasture management (~30%), labour (~20%) and other costs such as water, depreciation and extension services (both artificial insemination and health care). Even with high productivity, the scale is quite low for semi-grazing farmers. As a result, a semi-grazing farmer needs about 10 cows to earn a daily income of 1 dollar a day (See Annex 6).<sup>25</sup>

As the vast majority of famers in Uganda own less than 5 cows, in order to help them rise above the poverty line, at least one of the following objectives must be pursued:

- increase in scale
- increase in productivity
- increase in profit margins
- increase in milk price at farm gate.

In fact, those objectives are inter-linked. To both increase scale and productivity requires financial resources that are not accessible to farmers and that may come from either a higher price paid per liter or from higher profitability.

### *Primary transportation*

Given the remoteness of most of the producers and the poor state of infrastructure, first transportation is usually by bike or on foot.

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<sup>23</sup> International standards set the poverty line at a dollar per day per family member.

<sup>24</sup> At a farm-gate price of 300 USh.

<sup>25</sup> Ibid.

A bike being the most prevalent mean of transportation, this study has focused on its cost dynamics. A number of interviews based on a random sample were conducted with bike transporters. The maximum capacity transported on a bike is about 40 liters. Then average distance observed was 10-30 km. Milk is purchased between 7 and 10 am and is delivered between 9 and 12 am. Milk that flows into the formal channel is usually either transported by farmers/family members to a primary collection point, or collected by the primary collection point at the farm gate. Typically, hawkers buy milk to resell it in the informal channel, either to consumers or to larger transporters/street vendors, who then transport milk to bigger villages/cities and sell it on the street.

### *Bikers*

Most bike transporters use plastic jerry cans to transport milk. This is unhygienic (and illegal) as they are more difficult to clean than the more expensive aluminum cans. Bikers earn a spread between the purchase and sale price, normally around 15% per liter. Milk purchase accounts for more than 95% of total costs, and thus profitability is mainly driven by variable costs. Because of their low scale (~20 liters on average), and relatively low profit margins (~15%), biking transportation is more a means of survival than a business. Most bikers have other jobs such as water/banana transporter or farmer (see Annex 7).

### *Primary transporters/street vendors*

Those are larger transporters who typically buy milk from bikers in small villages and take it to larger urban centers to sell. Milk purchase accounts for more than 75% of the sale price (~85% of total costs) and profitability mainly depends on the spread. The spread is driven by factors such as proximity of milk sheds to the market, and seasonality. Extra profits may derive from illegal practices such as water addition to milk, usage of smaller containers (450ml instead of the declared 500ml) or usage of illegal containers (jerry cans instead of steel cans).

In fact, cheating is profitable and makes economic sense. One of our sensitivity analyses shows that the profitability of a street vendor who sells 150 liters a day and charges a 20% spread would increase about six times by adding only 10% of water in the milk (from ~\$0.36 to ~\$1.67 per family member). If we also consider

that control is very low (transporters declared that they were checked twice a year), sanctions very light (no fine, the milk load just needs to be poured away) and moral concerns associated with malpractices almost non-existent (due to lack of education), it is clear why cheating is such a widespread practice amongst Ugandan informal transporters (see Annex 8).

### *Primary collection and transportation*

As mentioned, milk should be cooled within 2-4 hours from the moment it is milked. The main objective of chilling is to preserve the quality of raw milk and reduce spoilage before milk is subjected to further processing. Primary collection points are most often owned by farmer cooperatives. Producers are usually paid two weeks after milk has been received. Upon reception milk is tested and placed in a cooling tank to reduce its temperature to ~4C. Cooling center capacity ranges from 2,000 to 5,000 liters. Sometimes milk is sent to the bulking & chilling plant without being chilled.

In many cases milk it is not transported everyday (in the dry season it can sit in primary collection centers for 3-4 days before being sent to a bulking & chilling center, in the wet season this period is 1-2 days). This is due to the lack of minimum scale that makes transport from the primary collector to bulking & chilling centers profitable for the transporter (with price per liter fixed). Such bottlenecks highly jeopardize both the quantity and quality of milk supply in Uganda. To keep milk in a primary collection center for 4 days is very expensive (due to fuel used for the generator) and thus such bottlenecks significantly shrink the margins of those players along the value chain. Milk transportation cost per liter ranges between 30-35 USh per liter.

Profitability at primary collection centers is very low. With milk purchase accounting for more than 70% of the sale price and other costs accounting for about 25% of it (ie. chilling, transport, others), the profit margin is on average less than 5%.<sup>26</sup>

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<sup>26</sup> Assuming: purchase price = 300 USh per liter, plant capacity = 4k liters, average number of deliveries in wet/dry season = 25/15 a month.

Small transporters' profitability is mainly driven by capacity utilization. Fuel and fixed costs account for ~56% and ~14% of transportation fees per liter and good profitability can be reached only working at full capacity utilization.<sup>27</sup> As already mentioned, this causes big delays in milk delivery with milk sitting in primary collection centers for up to 4 days.

### *Bulking & chilling*

At the bulking & chilling level milk is either collected by the plant or delivered by producers or brokers. A lot of bulking & chilling plants do not actively manage transportation, leaving it up to members and other suppliers. After delivery, milk is tested for quality (fat content, temperature, presence of water, etc.). If accepted, milk is placed in a cooling tank to reduce its temperature to approximately 4 degrees Celsius. After the milk is cooled, it is usually taken over by processors and transported to their chilling or processing plant.

Milk purchase price accounts for more than 90% of the total sale price. Since the amount of electricity needed to run the cooling operation is not proportional to the quantity of milk in the tank, reducing the duration of stay of milk in the tanks can increase profitability. Some chilling plants are not connected to the power grid and need to use fuel-powered generators, which increases the cost of operation (the cost of electricity is about 2-3 USh per liter, fuel is about 15 USh per liter).

### *Large transporter*

When critical mass is reached, milk is pumped in trucks and leaves the bulking & chilling plant. Typically, one or more processor/transporter trucks are parked in the bulking & chilling plant, so that as soon as a load is collected (usually about 15k liters), the truck can leave. The whole cycle (from when the truck leaves the processing plant to its return) takes on average about 12 hours. In most cases the service is not run directly by either the bulking & chilling plant, or by the processor.

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<sup>27</sup> Assuming: capacity truck = 3k liter, transportation fees = 30 USh per liter, average trip = 20 km.

The most important profitability driver is the cost of fuel which accounts for more than 50% of the revenues from a single trip at current fuel prices. The average per liter fee charged by a large transporter is ~55 USH. Sensitivity analyses show that by charging 5 USH more per liter, a large transporter could afford to invest in better trucks, slightly increasing the profit margin. Using top class trucks would reduce the average transportation time from 12 hours to 8 hours (see Annex 9).

### *Processing*

The exact cost of dairy processing in Uganda is very difficult to determine considering that all financial data is confidential and that competition is very strong, leading to confidential treatment of any data which may uncover margins and costs. The costs used in this study were estimated based on industry interviews and comparison to international standards. Even if processors manufacture a variety of products (pasteurized milk, UHT milk, milk powder, cheese, yogurt, ice-cream, ghee, butter,...), our study is only focused on pasteurized milk, the lowest added value product. The goal of this study is to understand whether the Ugandan value chain is sustainable and efficient, and not to investigate processors' income statements.

In general, one of the main profitability drivers for processors is capacity utilization. In such a seasonal market, capacity utilization is really low (at an average of ~30%). In the dry season, some processors (including the incumbent) manage to process as little as one-third of the milk they process in the wet season. Such a phenomenon, of course, has a negative impact in per-liter fixed cost allocation.

For 1 liter of pasteurized milk (pouch packaging), raw milk is the most significant cost category, accounting for ~ 38% of the wholesale price for pasteurized milk. The cost of processing is difficult to determine given confidentiality in the industry and difficult allocation of fixed costs. However, our estimate of \$22 cents is in line with international benchmarks. In fact, an average cost for a US based milk processor is ~ US\$0.21 per liter and for a processor in Kenya is ~ US\$0.20 per liter. In addition, our estimate includes some US\$0.03 per liter for bulking & chilling operations upcountry.

Notwithstanding similar cost structures, Ugandan processors' average profit margins are much higher than both international benchmarks and Kenyan processors' ones. Namely, the average profit margin for a Ugandan processor is 22% per liter (before taxes), whereas it is only 10% for a Kenyan processor. The sale price per liter to agents/retailers is very similar (US\$0.61 in Uganda vs. US\$0.62 in Kenya), as is the packaging cost per liter (US\$0.03 cents in Uganda vs. US\$0.02 cents in Kenya) and, as already mentioned, the processing cost per liter. The critical difference resides in the milk purchase price. Whereas in Kenya at the bulking & chilling level the price is US\$0.34, in Uganda the price (excluding transportation costs that, however, are included in processing costs) is as low as US\$0.23. In addition, a 22% profit margin per liter is very high even compared to international benchmarks (16%). Given the dominant position of one player (Fresh Dairy/Sameer), it is likely that the market is inefficient.

Sensitivity analyses show that if a processor with such a cost structure paid up to US\$0.29 per liter for milk at the bulking & chilling level, the profit margin for a liter of pasteurized milk would be ~12%, thus in line with benchmarks (see Annex 10). Some small Ugandan processors pay as much as US\$0.35 for milk and still manage to be profitable.

## **ISSUES, RECOMMENDATIONS AND OBSERVATIONS**

Our analysis highlighted the following issues:

- Low productivity and lack of capacity utilization are key issues that can be tackled with proper advisory services
- Cheating and malpractices in the informal market are profitable
- Both controls and sanctions are inadequate to eradicate the problem
- Awareness of dangers resulting from cheating and malpractices is very low amongst both the public and industry's stakeholders
- Raising awareness will help solve this problem as (a) the public will pay more attention and (b) industry stakeholders will face higher moral concerns/community pressure if they decide to cheat

- The quality of statistics/studies on basic metrics such as milk production, market size, imports/exports is very low
- At current market prices (in the formal channel), small farmers live below the poverty line, making improvement in farming practices challenging
- Because of poor farming practices, milk production/delivery is heavily affected by seasonality
- Milk sits in primary collection centers for more than a day (sometimes 4 days)
  - Independent small primary transporters can only afford to transport milk at full capacity
- Processors' profitability is highly affected by low utilization ratios

In the light of such issues, the following seven actions are recommended in order to improve efficiency and sustainability in the Ugandan dairy sector:

1. To foster **advisory services to farmers, processors and other key players** in the value chain
2. To launch a **massive informative campaign** focused on (a) risks associated with consumption of adulterated/dirty milk and (b) diffusion of cheating/malpractice in the informal channel
3. **To establish more severe sanctions** for illegal practices in the industry
4. To **enhance level of local control** with local presence of an ad hoc authority
5. To give responsibility to a competent authority for **yearly reports** on the industry to be challenged/validated by an **independent experts committee**
6. To foster **integration within the first steps of the value chain**, particularly within primary collection/primary transport/bulking & chilling
7. To establish a **milk pricing methodology** aimed at rewarding both milk quality and consistency in delivery. Specifically, drivers related to (a) milk quality, (b) number of delivery days in a year should determine the premium paid by processors (on top of the 380 US\$ per liter base).

As a complement to such actions, following are some relevant observations:

- DDA is the authority that should be in charge of actions 1-2 and 4, and that should lobby at governmental level in order to pursue action 3
- DDA so far has not been able to fully perform its role because of:
  - lack of funds

- lack of territorial presence
- limited staff (~30 employees)
- A possible way to pursue actions 1,2,3 and 4 is therefore to increase both DDA's funding (informative campaign, studies) and DDA's presence in Ugandan territory (local control)
- Integration in the first steps of the value chain and establishing a premium for quality/delivery will (a) increase overall profitability and (b) make it economically sustainable to deliver small quantities of milk to b&c plant
- Processors can afford to pay up to 600 US\$ per liter and still be profitable
- Processors will highly benefit from more consistent milk supply by enhancing plant utilization, thus reducing per liter production costs.

## *Recommendations*

The major component missing on the ground is a basic system for data gathering and analysis, both on the farm and chilling plant level. Some chilling plants interviewed had a data gathering function in place, i.e. they were producing a basic set of financial data. However, the data was not used proactively to make strategic decisions. Most were unaware of even the basic metrics such as the break-even utilization rates. They also did not seem to practice any cost management, such as for example using flexible labor contracts to reduce costs in times of lower utilization. Turning chilling plants into hubs with multiple functions will put an additional strain on the current management capacity. TechnServe should develop a basic financial toolkit for farmers and chilling plants that will select and track main performance metrics. The main objective would be to analyze performance, serve as a quick indicator when and what operationally needs to be adjusted and provide input for strategic decisions (e.g. should a chilling plant buy or lease a truck, or outsource transport etc.). As Business Advisors are the main point of contact for chilling plants, they should participate in the financial toolkit development and be trained in basic financial and analytical skills.

In addition, lack of basic macro-data (milk production, value of both formal and informal market, etc.) makes research very hard. TechnoServe should therefore cooperate with local authorities to further develop/enforce trustworthy assessment methodologies.

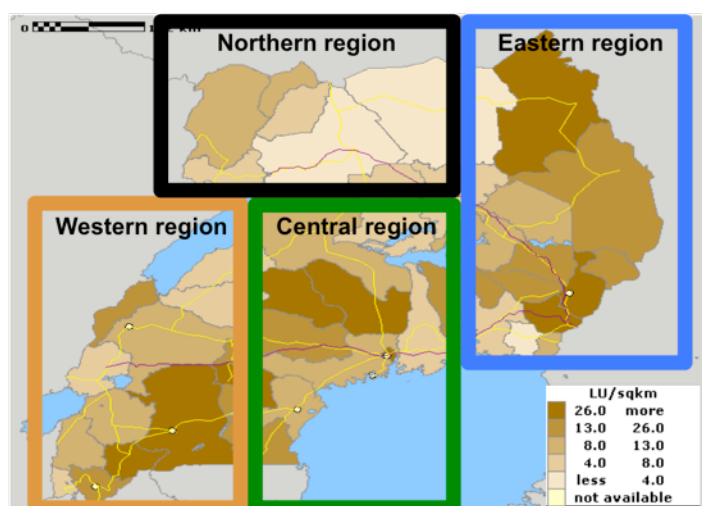
## ANNEXES

### Annex 1, Milk production methodology

Estimated milk production in Uganda 2007 – assumptions and methodology						
Assumptions	<b>Indigenous Cattle</b>					
	<b>Region</b>	<b>Western</b>	<b>Central</b>	<b>Eastern</b>	<b>Northern</b>	
	% adults over total population = a	45%	45%	45%	45%	
	% female over total adult population = b	80%	80%	70%	70%	
	% calving over female adult population = c	60%	60%	40%	40%	
	Period of Lactation (days) = d	200	200	200	200	
	Average Yield per cow (liters/day) = e	2.00	2.00	1.00	1.00	
	<b>Exotic/Cross-breeds Cattle</b>					
	<b>Region</b>	<b>Western</b>	<b>Central</b>	<b>Eastern</b>	<b>Northern</b>	
	% adults over total population = a	45%	45%	45%	45%	
% female over total adult population = b	90%	90%	90%	90%		
% calving over female adult population = c	80%	80%	70%	70%		
Period of Lactation (days) = d	240	240	240	240		
Average Yield per cow (liters/day) = e	7.50	7.50	5.00	5.00		
Formula	<b>Total production = # of cattle * a * b * c * d * e</b>					
Result	<b>1,059 mmL</b>					

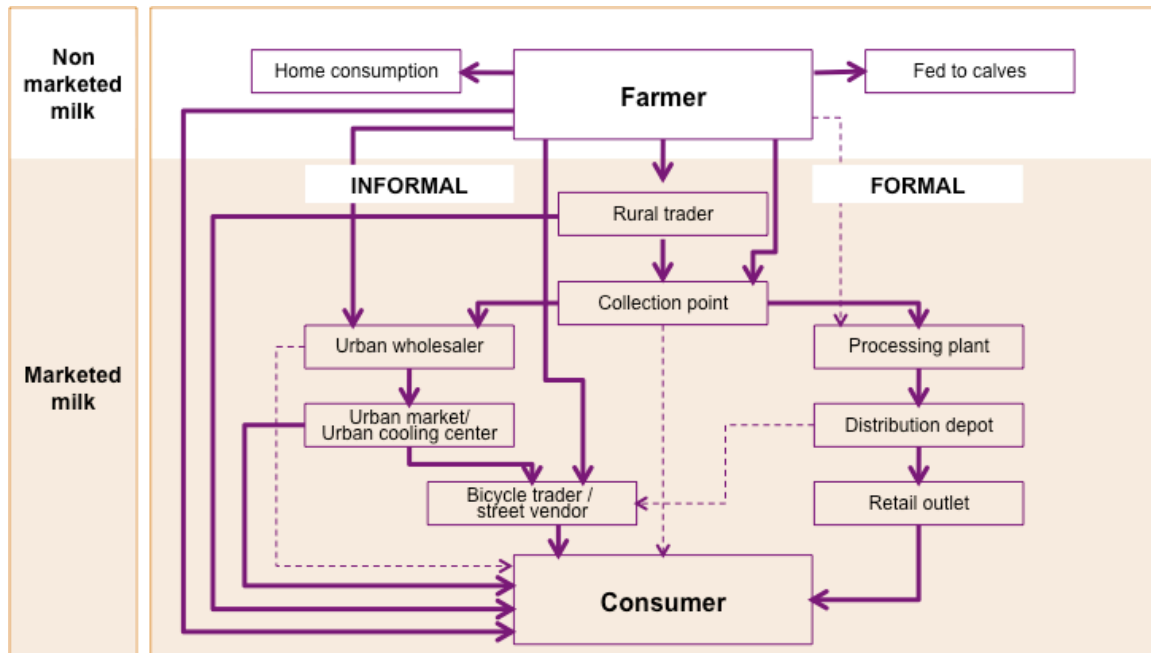
### Annex 2, Cattle concentration per region

Cattle concentration per region



Sources: Global Livestock Production and Health Atlas – Animal Production and Health Division FAO, 2002, Ugandan Bureau of Statistics, Population and Household Census 2002.

### Annex 3, Distribution channels



### Annex 4, Players in the Ugandan dairy value chain

	Production	Primary Transport	Bulking & chilling	Processing	Transport/distribution	Retail
<b>Players</b>	<ul style="list-style-type: none"> <li>~ 1.2 mm smallholders</li> <li>~ 8K large farms (&gt;100 cows)</li> </ul>	<ul style="list-style-type: none"> <li>Large number of individuals using bike, foot or vehicles</li> </ul>	<ul style="list-style-type: none"> <li>~ 200 bulking &amp; chilling plants, not all operational (formal) + 30 (informal)</li> </ul>	<ul style="list-style-type: none"> <li>15 registered, 1 incumbent (Sameer)</li> </ul>	<ul style="list-style-type: none"> <li>Informal: a number of brokers and hawkers</li> <li>Formal: a number of agents and distributors</li> </ul>	<ul style="list-style-type: none"> <li>Mobile: a large number of traders selling milk door to door</li> <li>Fixed: kiosks, stores, supermarkets</li> </ul>
<b>Concentration</b>		<ul style="list-style-type: none"> <li>Done by farmers or by processors when they buy directly from farmers</li> </ul>	<ul style="list-style-type: none"> <li>Owned by either producers or processors, some donor-funded</li> </ul>	<ul style="list-style-type: none"> <li>Own chilling plants (Sameer invested about 1.5 m\$ in B&amp;C centers upcountry)</li> </ul>		<ul style="list-style-type: none"> <li>Producers and transporters sometimes sell milk directly to end consumer</li> </ul>

### Annex 5, Free range farmer: Profitability analysis

Daily Income per HH member - USD	Price per liter - USH						
		250	300	350	400	450	500
Total # of cows	5	0.09	0.11	0.13	0.15	0.16	0.18
	10	0.27	0.31	0.35	0.38	0.42	0.46
	15	0.45	0.51	0.56	0.62	0.68	0.74
	20	0.63	0.71	0.78	0.86	0.94	1.01
	30	0.99	1.11	1.22	1.34	1.45	1.57

*Annex 6, Semi-grazing farmer: Profitability analysis*

Daily Income per HH member - USD	Price per liter - USH						
		250	300	350	400	450	500
Total # of cows	5	(0.27)	(0.05)	0.17	0.38	0.60	0.82
	10	0.45	0.89	1.32	1.75	2.19	2.62
	15	1.17	1.82	2.47	3.13	3.78	4.43
	20	1.94	2.81	3.68	4.55	5.41	6.28
	30	3.48	4.78	6.08	7.39	8.69	9.99

*Annex 7, Primary transport: Profitability analysis*

Daily Income per HH member - USD	Sale Price - USH						
		350	400	450	500	550	600
Purchased milk - Liters	10	0.04	0.05	0.06	0.07	0.08	0.08
	15	0.07	0.08	0.10	0.11	0.13	0.14
	20	0.10	0.12	0.14	0.16	0.18	0.19
	25	0.13	0.15	0.18	0.20	0.22	0.24
	30	0.16	0.19	0.22	0.24	0.27	0.30

*Annex 8, Transporter/street vendor: Profitability analysis*

Daily Income per HH member - USD	Spread on purchase price - %						
	15%	20%	25%	30%	35%	40%	
% of water added to milk	0%	(0.18)	0.36	0.91	1.45	2.00	2.54
	5%	0.45	1.02	1.59	2.16	2.73	3.30
	10%	1.07	1.67	2.27	2.87	3.47	4.07
	15%	1.70	2.33	2.95	3.58	4.20	4.83
	20%	2.33	2.98	3.63	4.29	4.94	5.59

**Annex 9, Large transporter: Profitability analysis (in case of regular trucks or “top” trucks)**

Profit margin %	Transport fee - USH						
	50	55	60	65	70	75	
Type of truck	Regular	0.14	0.19	0.23	0.27	0.30	0.33
	Top	0.12	0.17	0.21	0.25	0.28	0.31

**Annex 10, Processor: Profitability analysis**

Profit margin before taxes %	Milk Purchase Price - USH						
	380	430	480	530	580	630	
Type of product	1 Lt. UHT	0.36	0.33	0.30	0.27	0.24	0.21
	1 Lt. Pasteurized	0.22	0.17	0.12	0.07	0.02	(0.03)

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## WEBSITES

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[www.ifendairy.org/](http://www.ifendairy.org/)

[www.dairyafrika.com](http://www.dairyafrika.com)



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