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**BABCOCK INSTITUTE DISCUSSION PAPER
NO. 2005-4**

PROSPECTS FOR UGANDA'S DAIRY INDUSTRY

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**The Babcock Institute for International Dairy Research and Development
is a joint program of the
University of Wisconsin-Madison College of Agricultural and Life Sciences
University of Wisconsin-Madison School of Veterinary Medicine
University of Wisconsin Extension Cooperative Extension Division**

Funding for this study was provided by CSREES USDA Special Grant 02-34266-12789

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ISBN 978-1-59215-102-7

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PROSPECTS FOR UGANDA'S DAIRY INDUSTRY

William D. Dobson and David K. Combs*

EXECUTIVE SUMMARY

Introduction

- The objectives of this Babcock Institute Discussion Paper are to (a) analyze prospects for profitable development of Uganda's dairy industry, and (b) identify measures that would foster such development and increase the industry's contributions to food security and nutrition in Uganda.
- Numerous benefits could flow from profitable development of Uganda's dairy industry, but important challenges stand in the way of achieving those benefits. The most important challenges relate to poor milk quality and problems created by seasonal swings in milk production.

Impact of Uganda's Economic and Political Environment on Development of the Dairy Industry

- While conditions in Uganda are more promising than in neighboring countries, the economic and political environment in the country poses difficult challenges for the dairy industry.
- Questions regarding the long-term success of measures to combat HIV/AIDS represent a key uncertainty for Uganda.
- Income constraints in Uganda will limit overall consumption of dairy products and influence the amount of dairy products consumers obtain from the formal and informal markets.
- Despite challenges facing the industry, milk production in Uganda recorded a three-fold increase from 1991 to 2004.

The Structure of Uganda's Dairy Industry

- Uganda's informal market sector serves as a conduit for about 85 percent of the milk marketed in the country. The formal sector—which includes conventional milk processing—handles about 15 percent of the milk. Approximately 30 percent of the milk produced in Uganda is consumed on farms.
- Uganda's dairy industry is labor intensive and pasture-based.
- Traditional cattle, mostly Ankole, make up about 85 percent of the cattle herd. These cattle produce only one to two liters of milk per day. Higher producing mixed breeds and commercial herds make up the remaining 15 percent of the herd.
- Uganda's dairy belt lies in the Western part of the country, distant from Kampala.
- The country's milk assembly and production processes make it difficult for the industry to maintain milk and dairy product quality.

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- Uganda's Dairy Corporation has been targeted for privatization, but its status is currently in limbo. The failure of the Finance Ministry to either privatize, or withdraw the privatization initiative has created difficulties for the industry.
- Opportunities exist for firms in the formal sector to increase milk sales, but to do so they must demonstrate that they provide good value to consumers. Consumers of milk from the informal sector pay half the price charged in the formal sector.
- Uganda's Dairy Development Authority provides regulatory and dairy development services. However, the agency appears to have insufficient resources for carrying out all the tasks that it has established for itself.
- U.S.-based Land O'Lakes, Inc. has provided a host of valuable services to the industry.

Challenges Facing Uganda's Dairy Industry

- *Poor milk quality.* Most milk is adulterated with added water. Milk is tested at receiving stations only for specific gravity, a crude test for water adulteration. Pasteurized milk in Uganda has a very short shelf life—only three to four days—because of microbial contamination, poor milk handling, and transportation practices at the farm and manufacturing level.
- *Pronounced seasonality of milk production and consumption.* More milk is produced during the rainy seasons than can be marketed in the formal market.
- *A large informal dairy sector that is largely unregulated.*
- *Unreliable formal markets.* Some farmers find it difficult to secure prompt payment for milk and milk is refused at receiving stations during rainy seasons, forcing farmers to seek other outlets for their milk.
- *Large losses of milk in the production and marketing channels.*

Opportunities for Uganda's Dairy Industry

- Export markets and formal market sales of dairy products could be expanded.
- Processing facilities to handle seasonal milk surpluses could be built. This action would produce storable products that would enhance Uganda's food security.
- Processing facilities appear to be in place to handle an increase in the milk supply if demand for milk could be increased. Most plants appear to operate at much less than full capacity during much of the year.

Recommendations

- *Recommendation No. 1: Producer and Processor Incentives.* The industry and government of Uganda should adopt measures to give producers and processors incentives to produce higher quality milk and dairy products.
- *Recommendation No. 2: Resolve Dairy Corporation's Status.* The Finance Ministry should either more aggressively pursue ongoing efforts to privatize the Dairy Corporation or suspend those efforts and invest money in strengthening the company.
- *Recommendation No. 3: Expand School Milk Program.* If budget constraints continue to thwart expansion of the school milk program, then steps should be taken to expand school milk distribution by encouraging additional parental support for the program.

- *Recommendation No. 4: Focus Land O'Lakes Initiatives.* Land O'Lakes' initiatives should focus more heavily on marketing, especially export marketing and extending help to the industry for building plants to handle seasonal milk surpluses.
- *Recommendation No. 5: Clarify DDA Priorities.* Uganda's Dairy Development Authority should establish clearer priorities, initially emphasizing efforts to improve milk quality.
- *Recommendation No. 6: Establish an Export Market Authority.* Uganda's dairy industry and the government of Uganda should establish an export marketing authority whose priority would be to improve milk quality standards for exports and develop markets in neighboring countries.
- *Recommendation No. 7: Collect Better Statistics.* The government of Uganda should put in place mechanisms that would generate better statistics on the country's dairy industry.

The government of Uganda and people in Uganda's dairy industry understand the challenges facing the industry, but they appear much less certain about how to address the challenges. This study mainly calls for basic improvements in milk quality and additional plant capacity for producing storable dairy products to handle seasonal milk surpluses. These measures would improve nutrition, enhance food security and lay an important foundation for other improvements that would increase the profitability of the industry.

PROSPECTS FOR UGANDA'S DAIRY INDUSTRY*

William D. Dobson and David K. Combs

The objectives of this Babcock Institute Discussion Paper are to (a) analyze prospects for profitable development of Uganda's dairy industry and (b) identify measures that would foster such development and increase the dairy industry's contributions to food security and nutrition in Uganda.

Experience in sub-Saharan Africa shows that the following benefits can accompany profitable development of a country's dairy industry [2]:

- On-farm employment can be increased by dairying because it is a labor-intensive activity.
- Dairying can provide farmers with year-round income and help them diversify risk across enterprises.
- Development of the dairy sector can have important multiplier effects throughout the value chain from the farm to retail food stores.
- Milk-producing animals can make use of feeds that cannot be used directly by people.
- Expansion of a country's dairy industry can improve a nation's food security and nutrition.

Experience in these same countries identifies challenges frequently encountered in efforts to foster profitable dairy development, including those noted below, which have particular relevance for Uganda:

- Marketing milk and dairy products is complex and expensive.
- The quality of milk and dairy products is difficult to maintain, particularly in hot climates.
- Milk is subject to many forms of contamination and adulteration.

- Milk production exhibits seasonal variation, which creates seasonal milk gluts and shortages, as well as excess plant capacity at times of low milk production.
- Compared to grains and pulses (e.g., peas, beans and lentils), milk is a relatively costly source of nutrients.

Faced with these challenges it is unclear whether Uganda's dairy industry can achieve the benefits that can accompany profitable dairy development. As will be evident, there are significant impediments to improving milk quality and dealing successfully with problems created by seasonal swings in milk production and consumption in Uganda.

The disincentives for additional improvements in milk quality are probably most important. This factor has far-reaching implications for profitable dairy development in Uganda. One implication relates to the following comment, variants of which the authors heard frequently from people in Uganda's dairy industry: "Secure additional markets for Uganda's milk and dairy products and the needed milk production will follow." There is logic to this comment. But additional markets for Uganda's dairy products—especially expanded export markets—will be exceedingly difficult to obtain unless milk quality improves substantially.

This paper will examine the impact of the economic and political environment in Uganda on the structure and development of the country's dairy industry, challenges and opportunities facing Uganda's dairy sector, and recommendations for achieving profitable development of the nation's dairy industry.

*Information for this paper was obtained partly through a field study conducted by the authors from August 31–September 11, 2005 in Uganda. The authors' field study included visits with faculty of Makerere University, managers of Uganda's Dairy Corporation, officials of Uganda's Dairy Development Authority, the Honorable M. Mugenyi (Uganda's State Minister of Agriculture, Animal Industry and Fisheries), USAID officials, managers and directors of dairy cooperatives, managers of dairy processing plants, and dairy farmers. This information was supplemented with published material and information available on the internet.

IMPACT OF UGANDA'S ECONOMIC AND POLITICAL ENVIRONMENT ON DEVELOPMENT OF THE DAIRY INDUSTRY

Uganda's dairy industry will not develop in isolation. Indeed, it is frequently noted that a healthy economic and political environment is needed to foster profitable development of most sectors of a country's economy, including the dairy industry. Information appearing below provides background on economic and political conditions in Uganda and discusses how those conditions affect development of the country's dairy industry.

Geography, Population and Measures of Economic Performance

Uganda occupies 236,040 square kilometers of territory, an area approximately 1.6 times the size of Wisconsin. The country is located in Eastern Africa and borders Kenya, Tanzania, Rwanda, the Democratic Republic of the Congo and Sudan. Lake Victoria—one of the largest fresh water lakes in the world—is located on Uganda's southeastern border. Africa's Nile River originates in Lake Victoria on Uganda's southern border.

Uganda has 56 Administrative Divisions. Kampala, with a population of about 1.5 million, is the country's

capital city. A large number of additional people commute to Kampala from nearby areas to work, market products and shop. Other major Ugandan cities include Gulu, Lira, Jinja, Mbale, Mbarara, Masaka, Entebbe, Kasese and Njeru.

Selected statistics relating to Uganda's economy, health of the population and the prevalence of corruption appear in Table 1. Comparable statistics for the bordering countries of Kenya, Tanzania, Rwanda, the Democratic Republic of the Congo and Sudan are also included in the table.

Uganda's total population was approximately 26.4 million in mid-2004—lower than the average for the five bordering countries. The five-country population figure was expanded by the large figure—58.3 million—for the Democratic Republic of the Congo. Uganda's population is moderately lower than that of Kenya, Tanzania and Sudan, countries with populations ranging from 32.0 million to 39.1 million. Rwanda has the lowest population of the bordering countries—7.9 million in mid-2004.

Kampala, Uganda's largest city, has a population equal to only about 5–6 percent of the national total, underscoring the fact that Uganda's population is dispersed across the country. The rural nature of the country is indicated by the 82 percent of the population employed in agriculture (Table 1).

In a number of respects, the figures for Uganda are similar to those for the five bordering countries. However, Uganda's population growth rate and real gross domestic product (GDP) per capita in purchasing power parity (PPP) terms appear modestly higher than the average for the bordering countries.

Questions can be raised about the accuracy of Uganda's real GDP per capita in PPP terms (U.S. \$1,500 in 2004). Expressing real GDP per capita figures in PPP terms takes into account differences in prices and the cost of living in the countries being compared. The complex adjustments associated with PPP computations can introduce errors. However, there are plausible reasons for the reported PPP per capita figure for Uganda. For example, Uganda's low inflation rate in the early 2000s probably contributed to a higher real GDP figure in PPP terms than those in neighboring countries. While Uganda may have a higher real GDP



Source: CIA World Factbook [13].

TABLE 1. Selected Statistics for Uganda with Averages for Five Adjoining Countries

Item	Uganda	Five-Country Average
1. Population (mid-2004 est.)	26,404,543	34,806,037
2. Population Growth Rate (2004 est.)	2.97%	2.11%
3. GDP per Capita, PPP in U.S.\$ (2004 est.)	\$1,500	\$1,080
4. Real GDP Growth Rate (2004 est.)	5.0%	4.5%
5. Unemployment Rate (2001 est.)	N.A.	29.3%
6. Labor Force in Agriculture (1999 est.)	82%	81%
7. Population Below Poverty Line (2001 est.)	35%	49%
8. Consumer Price Inflation (2004 est.)	3.5%	8.5%
9. HIV/AIDS Adult Prevalence Rate (2003 est.)	4.1%	7.8%
10. Literacy Rate (2003 est.)	70%	72%
11. Transparency International Corruption Perceptions Index, 2004	2.6	2.4

Sources: Exxun.com, CIA World Factbook and Transparency International [4, 13, 14]. The five-country averages represent mean figures for Kenya, Tanzania, Rwanda, Democratic Republic of the Congo and Sudan. Dates appearing after the item number apply to Uganda. The five-country averages are based on figures for various years, generally 2001 to 2004. Figures were not available for all countries in the five-country group for unemployment rate, labor force in agriculture and the Transparency International Corruption Perceptions Index. Averages for these variables are based on countries for which figures were available. Key for interpreting Transparency International Corruption Figures: 10 = highly clean, 1 = highly corrupt. N.A. = not available.

per capita in PPP terms than its neighbors, it is a poor country. The U.S.\$1,500 per person figure for Uganda is only 4 percent of the U.S. figure. Moreover, in the early 2000s, about 35 percent of Uganda's people lived on the equivalent of less than one U.S. dollar per day in nominal (not PPP) terms [5].

About 35 percent of the people in Uganda have incomes that place them below the poverty line (Table 1). While lower than the average for the five bordering countries, this figure is still relatively large.

Uganda's real GDP growth rate in 2004 was a "respectable" 5 percent. Growth rates in this range should help to pull more people out of poverty. If Ugandan consumption patterns are like those of most of sub-Saharan Africa, then the income elasticity of demand for dairy products in the country is likely to be relatively high [2]. Thus, higher incomes should foster additional consumption of dairy products in Uganda.

A major problem for Uganda is the prevalence of HIV/AIDS in the population. However, with assistance from international health organizations, Uganda has made progress in dealing with this problem. Indeed, Uganda has been identified as a model country for

dealing with the AIDS crisis. The smaller incidence of HIV/AIDS in Uganda's adult population compared to the five bordering countries is shown in Table 1. However, as noted later, questions have been raised about the sustainability of Uganda's progress in dealing with HIV/AIDS.

Uganda, like the bordering countries, is plagued by corruption. Uganda's 2.6 figure in Transparency International's Corruption Perceptions Index places the country at the top of the bottom third of countries for which an index was obtained by Transparency International. Among other things, widespread corruption deters foreign direct investment in a country.

Uganda has a floating exchange rate that reflects market conditions. The country's currency—the Ugandan Schilling—has weakened against the U.S. dollar during the past decade, losing approximately half its value versus the U.S. dollar from 1995 to 2003 (Table 2). However, the Schilling strengthened relative to the dollar in 2004 and early 2005.

Several factors explain in part the longer-term weakness of the Schilling in foreign exchange markets. First, the country has run a current account/trade

TABLE 2. Exchange Rates, Ugandan Schillings (UGX) per U.S. Dollar, 1993–2005

Year	UGX per U.S. Dollar
1993	1195
1994	980
1995	969
1996	1046
1997	1083
1998	1240
1999	1455
2000	1644
2001	1755
2002	1798
2003	1964
2004	1802
2005*	1733

Sources: Bankintroductions.com-uganda and CIA World Factbook [1, 14].

*Average exchange rate for first half of 2005.

deficit—in 2004 the deficit was U.S.\$237 million, and in the early 2000s, the current account/trade deficit was much higher than the 2004 figure [14]. In 2001, for example, the current account deficit was a relatively large 8.3 percent of GDP. Second, the country is vulnerable to price volatility and erosion of foreign markets for its leading export, coffee. International coffee markets have become volatile because of additional coffee exports from Vietnam and other countries. Finally, confidence in the Schilling may also be shaken by actions of insurgents in the north of the country. The weaker Schilling presumably will stimulate exports and help reduce the country's current account deficit.

Uganda's public debt is a point of concern. In 2004, the public debt was a relatively high 74 percent of GDP [4]. Public debt in excess of 60 percent of GDP sends up warning flags that raise questions about a country's ability to service the debt. However, in the early 2000s, Uganda qualified for debt relief as a Highly Indebted Poor Country and also obtained debt relief from the Paris Club. This debt relief helped Uganda manage its public debt without resorting to draconian measures. The country's deficits are also a matter of concern. However, Uganda's 2004 budget deficit appeared to be manageable at about U.S.\$236million [4].

How Uganda's Economy Reached its Present State

Uganda's economy has a turbulent history. Uganda achieved independence from the UK in 1962. Many observers have characterized Uganda's government regimes in the early years following independence as catastrophes. For example, Idi Amin's dictatorial regime (1971–1979) was responsible for the deaths of some 300,000 opponents of his regime [14]. Guerilla war and human rights abuses under Milton Obote (1980–1985) claimed at least an additional 100,000 lives [14]. These leaders contributed to war and anarchy in the country, with predictable effects on Uganda's economy.

President Lt. General Yoweri Kaguta Museveni became President and Chief of State in Uganda in 1986. He won elections in 1996 and 2001. Uganda's constitution has been amended to permit President Museveni to run for a third five-year term in 2006.

While there is still unrest in parts of Uganda—chiefly in the north because of the actions of Joseph Kony and the Lord's Resistance Army, much of Uganda is now stable. This stability has helped to improve the country's economy. Reforms adopted by the Museveni government have also contributed to an improved economy. Among the most important reforms was the restoration in Uganda of a legal system based partly on English common law. This facilitated the functioning of capital markets and reduced corruption. Privatization measures—including some in the dairy industry—also contributed to improved performance in the economy.

A Canadian banking research organization described additional economic reforms that have been implemented in Uganda as follows [1]:

. . . Reforms (beginning) in 1986 centered on currency reform, programs to reduce inflation and to stimulate GDP growth via increased export earnings with higher domestic production. The next phase of economic reforms took place in the mid-1990s directed at economic sectors including banking and social policy such as health and education. With the help of foreign aid donors and financing from the International Monetary Fund, World Bank and others, Uganda has steered monies toward upgrading its infrastructure and programs to fight

poverty. National AIDS infection rates have fallen dramatically for Uganda to the current 10 percent (adult infection rate is down sharply to 4 percent) from 25 percent for the entire population in 1992. Forceful government-sponsored AIDS education policies . . . (resulted) in one of the few AIDS success stories within Africa today.

Unfortunately, Uganda's successes in combating AIDS may not be as great as these comments suggest. Global health specialist, Laurie Garrett, described the AIDS situation in Uganda in 2005 as follows [6, p. 53]:

Uganda . . . may be backsliding after what seemed to be early progress against the disease. Ugandan scientists warn that the apparent downward trend in HIV/AIDS there may be merely a hiatus in the epidemic, caused not by an effective AIDS-control campaign but by the wholesale death of the infected adult population; April 2005 data show that adult infection rates are indeed climbing. If these analysts are correct, Uganda could experience yet another round of infection, disease and death when today's youth become sexually active adults.

Rakai and Masaka, major milk-producing districts in Uganda, have been devastated by HIV/AIDS since the onset of the disease [7]. HIV/AIDS causes labor shortages on farms and frequently forces sale of livestock to provide funds for care of the sick and funeral expenses. It is unclear how much the improved HIV/AIDS control measures for the country as a whole have been felt in these districts.

Thus, the jury is still out on how effectively Uganda is combating HIV/AIDS. But it is clear that HIV/AIDS has dramatic negative effects on businesses. In hard-hit countries, businesses lose up to 3 percent of their labor force to the virus each year [6, p. 52]. The presence of HIV/AIDS also discourages foreign direct investment, since few companies are interested in building operations in countries where labor productivity is low and costs are dramatically affected by the disease [6, p. 61].

Impacts of the Economic-Political Environment on Uganda's Dairy Industry

Privatization measures adopted as part of economic reforms have changed the role of Uganda's govern-

ment in the dairy sector. One noteworthy measure was the establishment of the Dairy Development Authority (DDA). The Dairy Industry Act of 1998 established the DDA as a corporate entity under Uganda's Ministry of Agriculture, Animal Industries and Fisheries. Initially, the objective specified for the DDA and the role anticipated for the Agency were as follows [5, pp. 5–6]:

*(To) provide proper coordination and efficient implementation of all government policies, which are designed to achieve and maintain self-sufficiency in the production of milk in Uganda by promoting production and competition in the dairy industry, monitoring the market for milk and dairy products, and carrying out regulatory functions in the dairy industry . . . **The role of the government in the dairy sector has changed from direct participation in milk production, processing and marketing to creating an enabling environment in which farmers and private investors can grow and develop the dairy industry.** (Emphasis supplied).*

The latter part of this quote overstates the reduction in government involvement in Uganda's dairy sector since the Dairy Corporation remains in government hands. Uganda's Dairy Corporation (a parastatal dairy processing organization) has been targeted for privatization. But, the Finance Ministry has not yet found a way to privatize the organization in an acceptable manner to concerned parties. The lengthy delays associated with this privatization initiative have caused problems in Uganda's dairy industry.

The weakening of the Uganda Schilling presumably will change the import/export mix for Uganda's dairy industry. The period 1994 to 2001 was marked by a substantial decline in Uganda's dairy imports. In this period, Uganda's dairy exports were irregular and showed no clear trend. The decline in dairy imports undoubtedly reflected effects of import substitution associated with expanded domestic milk production but probably also reflected the decline in the value of the Uganda Schilling, which made dairy imports more expensive. The behavior of the Schilling will probably continue to limit Uganda's dairy imports.

The environment for Ugandan dairy exports will be improved by the East African Customs Union, which includes as members Uganda, Kenya and Tanzania. The customs union, which became effective on Janu-

ary 1, 2005, will eliminate tariffs and other charges on goods exported to member countries. Mr. David Balikoowa, a Dairy Development Authority research officer, described the impact of the customs union on Uganda's dairy exports as follows [10]:

The immediate implication of the internal tariff reduction will be that Kenya's duty on imports of dairy products from Uganda will (be reduced) from 6 percent to 0 percent while Tanzania's duty on imports of dairy products will (be reduced) from 30 to 0 percent, laying ground for a good trading environment. . . . (However, despite the large market potential for the region) Uganda's exports of dairy products to the region are negligible . . . (and the East African Community largely imports dairy products from third countries.

THE STRUCTURE OF UGANDA'S DAIRY INDUSTRY

The structure of Uganda's dairy industry can be described in simplified terms using Figure 1. A key characteristic of the industry is the large informal sector that serves as the conduit for approximately 85 percent of the milk marketed in Uganda. The formal sector—which includes conventional milk processing—handles only about 15 percent of the milk marketed in the country. Approximately 30 percent of the milk produced in Uganda is consumed on the farm and enters neither formal nor informal marketing channels. Farmers find ready markets for their milk in both the formal and informal sectors.

Milk and dairy products consumed on farms make important contributions to nutrition in Uganda. There is evidence that households in Uganda with one or more dairy cows are healthier than households without dairy cattle. This is partly because milk is a whole food that supplements other facets of the diet.

Dairy Farmers

In 2005, there were approximately 15,000 dairy farmers in Uganda. However, this number is “soft” since some farmers who are primarily beef producers enter and exit from milk production depending on whether it is profitable to sell milk.

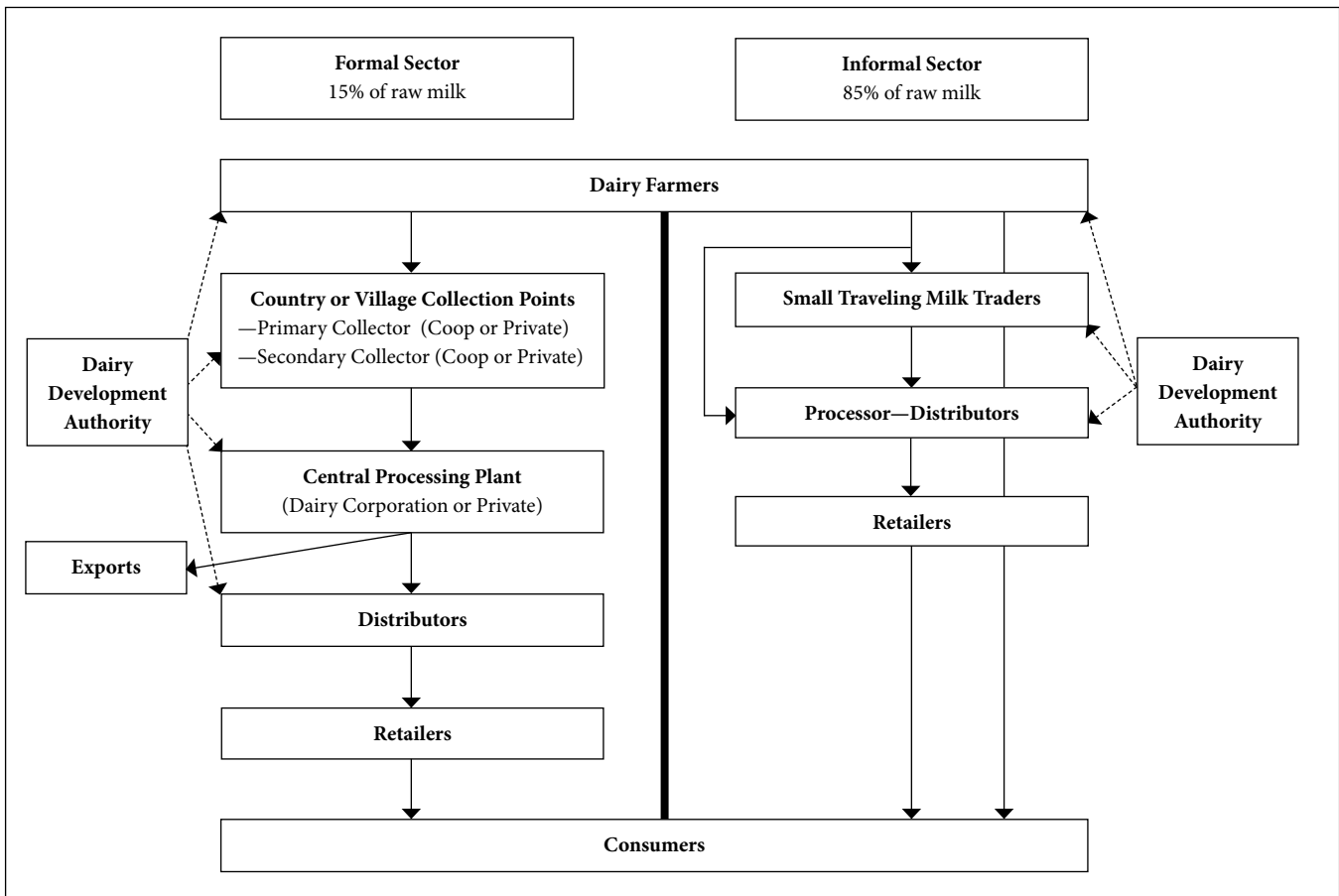
In summary, while conditions in Uganda appear more promising than in neighboring countries, the economic and political environments existing in Uganda pose difficult challenges for most sectors of the economy, including the dairy industry. First, while corruption in Uganda is lower than in years immediately following independence, it remains a serious problem. Second, questions regarding the longer-term success of measures to combat HIV/AIDS represent a key uncertainty facing Uganda's economy. Finally, low consumer incomes will limit the aggregate amount of milk and dairy products consumed and limit consumer purchases of high-priced dairy products from the formal sector. However, despite the challenges, Uganda's milk production recorded a threefold increase from 1991 to 2004 (to more than one billion liters in 2004), suggesting that milk production is regarded as a relatively favorable enterprise by Uganda's farmers.

Dairy farming in Uganda is a labor intensive enterprise. Cows are milked by hand twice daily and cattle are tended while they graze. The low labor costs—the equivalent of U.S. \$25 to U.S. \$50 per month plus food and lodging for farm laborers—limit the amount of mechanization that will occur in the industry.

The Industry is Pasture-Based

While communal pastures are still employed in Uganda, fenced, improved pastures have become common. The soils, climate and rainfall in Uganda are conducive to pastoral dairy systems. However, inputs such as fertilizer, water systems to provide drinking water for cattle, and insecticides to control pests appear to be prohibitively expensive for most farmers. Supplements are fed sparingly to cattle and most supplements consist primarily of low-quality byproduct feeds. Unless farmers receive substantially higher prices for milk, there will be little incentive to further improve pastures.

Processors pay Uganda's dairy farmers on the basis of volume of milk sold rather than on the value of the milk components. Milk is tested for water adulteration with an imprecise specific gravity method when it is received at the primary collection stations. It appears

FIGURE 1. Processing and Marketing Channels for Milk and Dairy Products in Uganda

Source: Authors rendering.

that most farmers know how much water can be added without having their milk rejected. This creates incentives for farmers to add water to the milk and to give insufficient attention to increasing the butterfat or protein content of the milk. As a result of the payment system, the price processors pay for raw milk received from farmers frequently fails to accurately reflect the value of the raw product for producing cheese, butter and a host of other finished dairy products. The payment system also contributes to reducing the nutritive value of milk.

The Government of Uganda is currently attempting to reduce the problem of water adulteration by arresting, fining and even jailing producers who are caught trying to sell milk that has been adulterated with water. But few arrests have been made and farmers caught selling adulterated milk in the formal sector can sell their product in the informal sector.

Milk is not tested for bacteria at the local level and milk from many farms is commingled prior to being cooled at the primary receiving stations. Microbial contamination of milk is common and there is no means for identifying the source of the contamination. As a result of microbial contamination and other problems, the shelf life of milk is short—even pasteurized milk has a shelf life of only three or four days.

M.L. Serunjogi, a Food Science and Technology faculty member at Makerere University, estimated that 25–30 percent of Uganda's milk supply comes from the commercial dairy herds and that part of the recent increase in milk production in Uganda can be attributed to added production from the commercial herds.

Serunjogi described the approximate composition of Uganda's dairy herd and the amount of milk produced per day by the different types of cattle as follows [12]:

<i>Type of Herd</i>	<i>% of Cattle</i>	<i>Daily Production</i>
Traditional, mostly Ankole	About 85%	1 to 2 liters
Mixed breeds	3–5%	3 to 5 liters
Commercial, includes Friesian crosses	10%	Up to 20 liters

Cattle diseases are prevalent in Uganda, including brucellosis, tuberculosis and foot and mouth disease. Foot and mouth disease is controlled through vaccination, but not all cattle are vaccinated. Consumers still contract brucellosis from drinking raw or improperly processed milk. The symptoms of brucellosis and malaria are similar in humans (persistent fever) and often brucellosis is diagnosed after an infected person fails to respond to malaria treatment.

Traditional breeds continue to account for a large percentage of Uganda's cattle population partly because these breeds are more resistant to diseases, ticks and other insect pests than Friesian crosses. Indeed, as profit squeezes have hit Ugandan dairy farmers some have reduced the number of Friesian and other crosses in their herds, partly because the traditional breeds require fewer purchased inputs to maintain their health.

While the traditional breeds exhibit these strengths, their low production is a liability. In addition, the Ankole heifers typically produce the first calf at age four. This contrasts sharply with Holstein-Friesian heifers in the U.S. and Western Europe, which give birth to the first calf and begin producing milk at about twenty-four months. Thus, if Uganda's dairy industry is to evolve profitably the national dairy herd will need a larger number of mixed breed cattle and commercial cattle.

While somewhat dated, the 2001 figures in Table 3 show where milk production is concentrated in Uganda. The Mbarara district is clearly the largest milk producing district in the country. The top ten milk producing districts accounted for two-thirds of the milk produced in Uganda. Many of the top milk producing districts are located in western, southwestern and south central Uganda. Exceptions include the Moroto and Kotido districts which are located northeast of Kampala. The one-third of the country's milk production not produced in the top ten districts was produced

TABLE 3. Uganda's Milk Production by District, 2001

District & Ranking	Milk Production (1,000 liters)	% of Total
1) Mbarara	144,085	16.0
2) Moroto	94,243	10.5
3) Bushenyi	90,378	10.0
4) Kotido	49,663	5.5
5) Masaka	45,694	5.1
6) Mbale	42,406	4.7
7) Kabarole	35,124	3.9
8) Mukono	34,563	3.8
9) Rakai	34,191	3.8
10) Mpigi	30,462	3.4
Total for Top Ten Districts	600,809	66.7
Total for 29 Other Districts	299,894	33.3
Total for 39 Districts	900,703	100.0%

Source: Dairy Development Authority [3].

in 29 other districts, all but one of which produced less than 30,000 liters of milk in 2001.

The Formal Sector

Country or Village Collection Points. Primary and secondary collection points are used in a variety of ways for assembling milk for processing plants in the formal processing sector. Most farmers live within one to three kilometers of a collection station and in many villages there are several formal and informal collection centers. Farmers milk cows by hand twice daily and transport milk to collection centers via bicycle after each milking. Farmers need to transport the milk to collection points shortly after milking because in almost all cases they do not have facilities to cool canned or bulk milk on the farm.

In many instances milk collected in tanks located in farming areas is transferred to metal milk cans, which are used to ship milk to secondary collection stations. Bulk milk trucks then pick up milk from the secondary processing stations for transport to processing plants in Kampala or elsewhere. In some areas, milk is transferred by cans from primary collection stations directly to milk processing plants. Thus, many varia-

tions exist regarding use of the country or village collection points for gathering milk.

The complexity of the milk assembly process in Uganda creates milk quality problems. Transfer of milk from the farm to a primary collection point, from the primary collection point to a secondary collection point, and finally to the milk processing plant introduces multiple opportunities for contamination of milk from adulteration, dust, dirty hands, and unhygienic cans, hoses and bulk tanks.

Central Processing Plants. Dairy processing companies that operated in Uganda's formal markets in 2003–2004 are listed in Table 4. Plants located in Kampala accounted for 161,000 liters of plant capacity (44 percent) and those in Mbarara accounted for 143,000 liters of capacity (39 percent). The remaining plants were generally small and accounted for only 17 percent of the nation's processing capacity. The figures in Table 4 should be regarded as approximate since the estimates of installed processing capacity differ substantially from some earlier estimates.

The Dairy Corporation is a dominant firm in the industry. The future of this firm has important implications for Uganda's dairy industry. Dr. Jim Yazman, who evaluated the USAID-funded program entitled Uganda Private Sector Dairy Industry Development Activity, that is operated mainly by Land O'Lakes, Inc., described the origins of the Dairy Corporation as follows [15, pp.6–7]:

The Dairy Corporation is an enterprise similar to those built in countries across Asia, Latin America and Africa during the 1970s . . . These “dairy enterprises” were developed as a means to stimulate milk production and marketing to the benefit of urban consumers, and to provide employment and enterprise diversification opportunities to smallholders. Like the Dairy Corporation, these were operated as parastatal enterprises with three basic missions: (1) collect, process and commercialize milk, and milk products in benefit to urban populations; (2) provide a market for smallholder producers and services such as training, technical assistance and often credit; and (3) promote and regulate the development of the dairy industry.

TABLE 4. Uganda's Dairy Processing Companies

Company	Location	Installed Processing Capacity (1,000 liters/day)
Alpha Dairies	Mbarara	50
Anifarm	Entebbe	6
Birunga Dairy	Kisoro	8
Dairy Corporation	Kampala	130
East African Foods	Kampala	6
GBK	Mbarara	90
Gouda Gold	Kampala	5
Jesa Dairy Farm	Busunju	20
Kaisa Fresh Milk	Kamuli	10
MADDO Dairies	Masaka	2
Mona Foods	Kampala	20
Paramount Dairy	Mbarara	3
Teso Dairies	Soroti	3
White Nile Dairies	Jinja	10
Total Installed Processing Capacity		363

Source: Dairy Development Authority [3].

Yazman described the less than promising evolution of organizations such as the Dairy Corporation, in these terms [15, p.7]:

*With few exceptions, these “dairy development enterprises” evolved into money-losing operations that had to be propped up with public funds. Part of the problem has arisen due to the changing peri-urban landscape around the plants. Originally most of the milk was procured from farms close to the plant. As has happened around Kampala, rapid urbanization has converted much of the pasture into roads, houses and factories. The processing plant had to go further and further out to procure milk at a significantly growing expense for transportation and maintenance of cooling centers. Most of the milk for the Dairy Corporation now comes from the Western region, some five hours away. **At the same time, the “social mission” of these plants, similar to the Dairy Corporation, implied a commitment to collect often uneconomical quantities of milk from***

individual farmers and milk cooling centers well beyond the radius of an economical supply shed (emphasis supplied).

Yazman characterized the current condition of the Dairy Corporation's processing plant in Kampala as follows [15, p. 8]:

The core Dairy Corporation plant appears to be in fairly good shape, though some processing equipment is over twenty years old, milk tankers are equally old, and the plant has no refrigerated delivery trucks. The Ministry of Finance's privatization agreement may protect current suppliers (cooperatively managed bulking centers) against drastic and imminent price reductions and procurement changes in the short-term . . . The four bulking centers in Southwest and West that are assisted by Land O'Lakes are all selling the majority of their milk to the Dairy Corporation. All are operating using Dairy Corporation-leased equipment, and depend on Dairy Corporation tankers to move their milk to Kampala. Milk is moving over 400 km to reach Kampala from the bulking centers. With \$4.00 per gallon diesel and tanker trucks that are beyond their useful life, is Bushenyi and Ntungamo a feasible, economic milkshed for a privatized Dairy Corporation?

Yazman's observations appear to be highly relevant. In addition, the authors noted that the Dairy Corporation's Kampala plant was operating at far less than capacity in September 2005 and that maintenance of equipment at the bulking centers using Dairy Corporation-leased equipment suffered from neglect. The authors were told that major strategic decisions, major personnel decisions, and apparently even decisions to provide spare parts for bulking station equipment leased by the Dairy Corporation were in limbo pending a decision on privatization of the Dairy Corporation.

Dairy Exports. Ugandan exports of dairy products have been small. One dated figure indicates that in 2001 Uganda's dairy exports were valued at U.S. \$3 million [5, p. 11]. Other figures suggest a smaller total value for Ugandan dairy exports in 2001. However, many processors believe that a potentially large regional market exists for Ugandan dairy products, partly because neighboring countries are dairy deficit

countries. UHT milk, ghee, milk powders and butter were mentioned as promising dairy exports.

Processors and cooperatives said that potentially attractive markets existed in Rwanda, the Democratic Republic of the Congo, Tanzania and Kenya. The latter two countries were thought to be promising in part because of tariff reductions for Ugandan dairy exports that emerged from adoption of the East Africa Customs Union. In 2005, Land O'Lakes reported that Gouda Gold had made cheese sales in Kenya, while Alpha Dairy Products exported UHT milk to Kenya and Tanzania [9, p. 3]. Opportunities for expanded Ugandan dairy exports are analyzed later in the paper.

Distributors and Retailers. The distribution and retailing components of the formal sector appear orthodox and include specialized dairy stores, meat and dairy product stores, and sales through supermarkets. Milk sold through the formal sector costs roughly twice as much as raw milk that is available in nearly every village and city. As a result, milk sold from the formal sector is purchased primarily by higher income groups and expatriates.

The dairy section in a major, upscale supermarket that the authors visited included fluid milk and yogurt from a number of Ugandan processors, hard cheese from Paramount dairy, and imported UHT milk from Kenya. At the time of the visit, fluid milk sold for approximately 1,100 Schillings (U.S. \$0.61) per liter. Soft drinks in the same store cost about the same as milk. Dairy processors in Uganda's formal sector also supply major hotels and restaurants in Kampala with fluid milk products and cheese. Cheese is not widely consumed by Ugandans. Accordingly, most cheese is marketed to expatriates.

A limited amount of imported dairy products were evident in upscale Kampala food stores. Fonterra of New Zealand marketed branded, upmarket hard cheeses in the country. In addition to UHT milk from a Kenyan processor, Nestle and other major international dairy firms sold milk powder and infant formula products containing milk powder in supermarkets.

The Informal Sector

Uganda's large, informal dairy sector is diverse. In many cases, a prominent component of the infor-

mal market consists of a covered, stainless steel bulk milk cooling tank located in a small building, which serves as the point of sale for customers in a village or city neighborhood. In other instances, the milk is sold in packaged, unpasteurized form from dairy stores in urban areas. In still other cases, the milk is sold by traveling traders who distribute it from a metal can transported on a bicycle to customers who provide their own milk containers. Finally, a limited number of traders sell milk directly from the farm to consumers.

In one village plant visited by the authors, the operations appeared to be a combination of formal and informal operations. The firm sold pasteurized milk in packaged form to at least one food market in Kampala. In addition, the plant sold milk—apparently unpasteurized milk—from a bulk, stainless steel tank to local customers in the village.

Uganda's Dairy Development Authority described the country's informal dairy sector as a large, *aggressive* (emphasis supplied) sector [3]. The sector may have earned the aggressive title because it is a low-cost, no frills sector that sells unpasteurized fluid milk at about half the price charged in the formal sector. One formal sector processor located in Mbarara described the dynamics of the situation. He said that his plant sold milk in Kampala because it was difficult to be competitive in Mbarara, noting that informal processor-distributors in Mbarara sell milk to consumers at approximately half the formal market price. He added that consumers of the lower-cost milk—who were accustomed to boiling all milk purchased to kill disease organisms—generally were unwilling to pay the higher price for milk available from the formal sector.

Processors in the formal sector said that consumers of the informal market products received dairy products that were adulterated with added water and sometimes chemicals that were used to preserve the product. A large majority of Uganda's consumers appear to be sufficiently price sensitive that they continue to purchase milk in the informal market, despite such shortcomings in product quality.

Consumers

In the early 2000s milk consumption in Uganda was low—about 28 liters per capita annually—compared to FAO recommendations (designed to meet particu-

lar nutrition standards) of about 200 liters per capita per year [5]. Higher milk production in Uganda has pushed per capita consumption upward in more recent years—the authors heard estimates that per capita milk consumption was now about 40 liters per capita. While aggregate milk consumption has increased, it is clear that consumption varies widely by region in Uganda and is affected by a host of factors including consumer incomes.

Impact of Distribution of Income. General information about the purchasing power and preferences of Ugandan consumers appeared earlier in this paper. In addition, M.L. Serunjogi of the Food Science and Technology faculty at Makerere University, categorized Ugandan consumers as follows [12]:

<i>Group</i>	<i>% of Consumers</i>
Expatriates and Other High Income Groups	10%
Other Medium to Higher Income Groups	20%
Remainder of Consumers	70%

This schedule indicates that Uganda's income distribution is skewed toward low income groups. However, this distribution—which shows relatively high purchasing power in the hands of as many as 30 percent of consumers—raises the possibility that the formal sector could command a larger share of the country's dairy sales. Moreover, dairy products from the formal sector are likely to be normal goods while those from the informal sector are likely to be inferior goods. Thus, as incomes increase in Uganda, the consumption of normal goods can be expected to increase, while consumption of inferior goods can be expected to decrease. However, the formal sector will have to demonstrate to consumers that it provides good value for the higher prices it demands, in order to achieve increases in market share.

School Milk Program. An expanded school milk program would increase the number of milk consumers and produce other benefits. Widespread support exists for an expanded school milk program because it is recognized that such a program would materially improve child nutrition. Efforts to expand school milk programs in Uganda have been halting and only partially effective. An effort to launch a school milk program in the

northern part of the country was discontinued partly because of problems with milk quality and other difficulties. A number of private schools—especially those in Mbarara, Kampala, Masaka and Mbale where parents pay for the milk—have operational school milk programs, but government schools show lower rates of participation in school milk programs [3, p. 14].

The bottom line is that the nutritional benefits from a school milk program are clearly recognized, but to date neither the DDA nor other government agencies have found ways to provide the financial subsidies needed to expand such a program in the public schools. In part, this is because the school milk program competes for resources with the multifaceted, high-priority government programs that are structured to ensure that all children obtain a primary education. However, because of recent changes in Uganda's political environment, the competition for government funding between primary education programs and the school milk program no longer appears to be regarded as a zero-sum game, where a gain for one program means an approximately equal loss for the other. This development makes expanded financing for school milk programs more likely.

A conference was held in Kampala in late September 2005 to share information on school milk programs in eastern and southern Africa. This conference may provide insights that would help to expand school milk programs successfully in Uganda.

Regulatory, Dairy Development and Supporting Organizations

The Dairy Development Authority (DDA). The DDA is an agency with dairy development and regulatory functions that influences both the formal and informal sectors of Uganda's dairy industry (Figure 1). The mission of the DDA as described in the agency's 2003–2004 Annual Report is as follows [3, p. 2]:

The mission of the DDA is to provide dairy development and regulatory services that will ensure increased production and consumption of milk (and create) a sustainable and profitable dairy industry sector that will contribute to economic development and improved nutritional standards in Uganda.

The DDA describes Uganda as having a small dairy market, a weak processing sector and an aggressive informal sector [3]. These problems challenge the dairy industry, and the DDA, to:

- Increase milk production, processing and marketing.
- Improve the quality of milk and dairy products.
- Commercialize milk production.
- Strengthen linkages with the various stakeholders in development at national and local government levels.
- Increase consumption of milk.
- Strengthen the dairy subsector.

These are ambitious challenges for the industry and the DDA. The DDA's Annual Report stated that, "DDA made a plan to attain and sustain a milk production growth rate of 12 percent per year between 2002–2007, and a 50 percent increase in milk deficit areas by 2007 [3, p. 3]." There is little evidence that the DDA and the industry can create incentives for such large increases in milk production. In general, the DDA seems to identify the challenges facing the entire dairy industry as challenges for the agency. However, the agency is likely to be most effective if it focuses on areas where it can make the biggest contributions. The DDA report indicates that the agency may have a strong positive influence in the area of improving milk and dairy product quality. Indeed, if the DDA focused its efforts more heavily in this area and brought about substantial improvements in milk and dairy product quality, it would help the industry meet other challenges that currently limit sector profits.

Land O'Lakes, Inc. Land O'Lakes, with financing from the U.S. Agency for International Development, has operated in Uganda for approximately ten years. Working in partnership with World Wide Sires and Heifer Project International, personnel from the U.S.-based cooperative have helped to strengthen Uganda's dairy industry. Land O'Lakes' efforts span Uganda's dairy production and marketing channel, and include contributions to improving herd health, dairy cattle breeding, milk quality, consolidating and strengthen-

ing producer cooperatives, providing new recipes and techniques for producing dairy products such as yogurt and ghee, dairy product promotion, market research, exporting initiatives, and dairy policy.

Uganda's producers and processors, without exception, lauded the contributions of Land O'Lakes to Uganda's dairy industry. However, many in Uganda's dairy industry have development priorities for the industry that differ somewhat from those of Land O'Lakes. In particular, people in Uganda's dairy industry, with few

exceptions, said that Land O'Lakes' future initiatives should focus more heavily on marketing, deemphasizing production-oriented work if necessary. Industry people emphasized the need for initiatives by Land O'Lakes in new product development, export marketing, and securing additional plant facilities to handle seasonal milk surpluses. Uganda's State Minister of Agriculture, Animal Industry and Fisheries also urged Land O'Lakes to place more emphasis on marketing.

CHALLENGES FACING UGANDA'S DAIRY INDUSTRY

Poor Milk Quality

Milk quality remains poor in Uganda, despite modest steps that have been taken to remedy the problem. Farmers are now required to transport milk to collection points or processing plants in metal cans rather than plastic jerry cans, which has improved sanitation. Secondly, open air boiling of milk to kill disease organisms is no longer permitted. Practitioners of open air boiling sometimes added water and chemicals to the milk during the boiling process. In addition, the open air boiling often resulted in recontamination of the milk when it was transferred to customers' containers.

While these modest steps were useful, much remains to be done. Part of the problem is that farmers in Uganda are paid for milk by volume rather than on the basis of valuable milk components or measures of milk quality. When a farmer brings milk to a collection point, the buyers examine the milk to see if it has bad odors or is obviously contaminated. Frequently, a crude test is used to check for excessive water adulteration. Some milk is rejected by buyers for failing such tests. But rejection of milk for adulteration with water seems rare since farmers have learned how much water they can add without having their milk rejected.

Tests for antibiotic contamination of milk appear to be lacking. However, Paramount Dairy—a producer of hard cheeses—does purchase raw milk only from producers the firm believes will deliver milk that is free of antibiotic contamination. This strategy is not surprising since antibiotic residues can spoil a batch of cheese.

The manager of White Nile Dairies in Jinja explained how difficult it is to deal with the problem of poor milk quality. This processor had sophisticated testing equipment that allowed him to test raw milk purchased for fat and protein content, the amount of added water, and other characteristics of milk quality. While this processor recognized the value of high-quality milk to his processing operation, he noted that milk producers have limited incentives to produce unadulterated milk of the highest quality. This is because—particularly in the dry season when milk is in short supply—producers who have milk rejected for poor quality or water adulteration at a collection station can simply approach another processor who would often purchase the milk.

The absence of on-farm cooling equipment in Uganda's relatively hot climate contributes to rapid deterioration in milk quality. This problem will continue because Uganda's small dairy farmers simply cannot afford such cooling equipment. The complex milk collection system mentioned earlier, which channels milk through primary collection points, secondary collection points, and finally transportation by bulk milk tankers to a processing plant, also introduces multiple opportunities for contamination and makes it nearly impossible to pinpoint the source of contamination.

The DDA has taken legal action against milk traders for milk adulteration. If such actions are pursued aggressively, it might help to improve milk quality in Uganda. However, until milk producers receive price incentives for producing high-quality milk, little improvement in milk quality is likely. The needed price incentives are more likely to materialize if a

larger number of Ugandan consumers demand higher quality milk or processors realize a higher return from high-quality milk products and develop a means of sharing the increase in profits with farmers.

Pronounced Seasonality of Milk Production and Consumption

Uganda's pasture-based milk production system generates marked seasonal variation in milk production. The country has two rainy seasons and two dry seasons which are approximately as follows [14]:

Rainy Seasons: March–May and
September–November

Dry Seasons: June–August and
December–February

Milk production in Uganda increases substantially in the rainy seasons, when pastures for dairy cows exhibit strong growth. Seasonal peaks in milk production are reportedly 20 to 45 percent higher than production in the months of low production [12]. The increased milk production coincides with periods of weak seasonal demand. This combination puts strong downward pressure on farm milk prices in the rainy seasons.

In early September 2005, when the rainy season had not yet fully materialized, dairy farmers commonly received prices of 350 to 400 Schillings (U.S. \$0.19 to \$0.22) per liter for milk. During the rainy seasons farm milk prices often drop to 100 to 150 Schillings (U.S. \$0.06 to \$0.08) per liter. In some instances, processors will not accept milk during short periods in the rainy seasons, even if farmers are willing to accept exceptionally low prices. In such instances, farmers are forced to dump the milk, feed it to other livestock or give the milk away.

The seasonal gluts in milk production and the mismatch between seasonal production and demand identify the need for processing facilities that would produce storable dairy products such as UHT milk, milk powders or hard cheeses. Adding capacity to produce stored dairy products could improve the profitability of the industry and enhance food security in the country. However, the high cost of borrowed capital for financing plant construction, lack of management experience for operating such processing plants,

absence of a cold chain for storing hard cheeses, and uncertainties about markets for storable products limit the opportunities for constructing plants to handle seasonal milk surpluses.

Losses of Milk and Dairy Products in the Production and Marketing Channel

Uganda's DDA reported the results of an FAO Post Harvest Losses Project that showed the following losses at different points in the production and marketing chain for dairy products (Table 5). The results show that up to 5.8 percent of the milk is wasted at the farm level. Overall losses were equal to about 25 percent of the milk produced and 19 percent of the marketable milk. The economic value of the marketable milk lost was reported to be about U.S.\$23 million per year.

While the figures in Table 5—particularly the U.S. dollar loss figures—must be regarded as approximate, they do suggest that large losses of milk and dairy products occur on the farm and in the marketing channel. The losses of milk in the processing and pasteurization activities (4 percent) appear particularly large. For example, transportation losses of 5 percent and processing losses of 3 percent of milk intake would be considered excessive for a commercial fluid milk processor in the U.S. Thus, practices that would reduce milk losses at the farm, transport and processing levels are likely to be areas worth pursuing.

TABLE 5. Annual Losses at Different Points in the Farm and Market Channel for Uganda's Dairy Products

Level	% Loss	Value of Loss (U.S.\$1,000)
Farm	5.8	\$5,778
Primary Collector	2.5	1,920
Secondary Collector	0.6	542
Transporter	5.0	5,236
Bulk Milk Pasteurizer/ Small-Scale Processors	4.0	4,548
Wholesaler/Retailer	2.7	3,316
Retailer	4.0	7,435
Total Value of Marketable Loss*		\$22,997

Source: Dairy Development Authority [3].

*Excludes losses at the farm level.

OPPORTUNITIES FOR UGANDA'S DAIRY INDUSTRY

Many opportunities exist for expansion of or improvements in Uganda's dairy industry. First, the country has a relatively favorable climate for expanded production of milk. Unlike other parts of East Africa where there is only one rainy season, Uganda has two rainy seasons that produce favorable pasture growth for dairy cows for additional months of the year. Second, many less than fully exploited opportunities exist to increase milk production through pasture improvements, expanding the use of artificial insemination, expanding the number of crosses of traditional cattle with dairy breeds on farms, and improved control of dairy cattle insects and diseases. Third, idle capacity exists in Uganda's processing plants that could be used to process dairy products for export. Finally, waste and spoilage of milk could be reduced.

While these improvements would be worth pursuing, farmers repeatedly emphasized that they see little point in adopting measures to increase efficiency and expand milk production if there is no profitable market for the additional milk. Indeed, some farmers experiencing profit squeezes had cut back on efforts to improve pastures, reduced the number of Friesian-cross dairy cattle in their herds, and reduced the use of purchased inputs to control insects and cattle diseases. Such farms had returned to traditional low-cost, low-output methods of production.

How should the opportunities in Uganda's dairy industry be taken advantage of? There are few, in any, viable strategies that could do all that is needed. Improving milk quality would be a valuable, high-priority first step for achieving the needed expansion of markets for Uganda's dairy products.

Expanding Dairy Export Markets and Formal Market Sales of Dairy Products

Many people in Uganda's dairy industry pointed to export markets as potential growth areas. They noted that other countries in the region are typically dairy deficit markets. Moreover, as pointed out earlier, the East Africa Customs Union has reduced tariffs on Uganda's dairy exports to Kenya and Tanzania. Finally, Ugandan firms have a history exporting dairy products to neighboring countries.

Useful information is available on how Uganda's dairy firms might expand exports. Land O'Lakes, for example, has made available to the industry an export handbook that contains market research and prescriptions for developing export markets for dairy products [8]. The handbook also lists the following challenges that Uganda's exporters of dairy products face [8, p. 3]:

- Lack of reliable data and information on export opportunities open to processors.
- Lack of capital to finance exports.
- Lack of trained and motivated manpower to execute export sales.
- Poor efficiencies in collection, processing and marketing among most processors in Uganda.
- Lack of enduring quality management practices and statutory certification.

Among other things, the Land O'Lakes handbook and other exporting guides show that it takes persistent efforts by skilled managers who repeatedly approach foreign buyers with suitable proposals to nail down export sales contracts. In addition, if Ugandan firms are to expand dairy exports, the companies must persuade foreign buyers that they represent dependable sources of high-quality dairy products at reasonable prices. Yazman described the importance of milk and dairy product quality to successful dairy exporting as follows [15, p. 13]:

It is difficult to envision a thriving dairy sector building a regional reputation in export markets in the absence of a quality testing program. In the absence of a strong quality monitoring program sanctioned and overseen by Government of Uganda authorities . . . Ugandan processors are susceptible to adverse publicity in market countries. A competitor in Kenya, Tanzania or another importing country could go public with false claims of adulteration or dangerous product crossing the border from Uganda, requiring Ugandan health authorities to take action. If Ugandan processors and their government agency partners could not point to a strong, consistent and well-managed quality assurance program that begins at the farm and bulk-

ing center level, they risk losing markets that were costly to develop.

Additional, more general information is available describing requirements that are frequently met by successful exporting industries. In a comprehensive study of practices of successful exporters, Professor Michael Porter of Harvard University's Business School, found that conditions in the domestic market often strongly influence the ability of different industries to export successfully. Specifically, Porter found that the following conditions often exist in the domestic markets of successful exporters [11]:

- Demanding domestic consumers put pressure on domestic companies to innovate rapidly and successfully.
- Government agencies enforce strict product quality, safety and environmental standards in the domestic market.
- Conditions exist in the domestic market that favor the formation of supporting clusters of industries.
- Governments avoid intervening in factor and currency markets.
- A strong government anti-trust policy sharply limits direct cooperation among industry rivals.

The first three points have particular relevance for expanding Uganda's dairy exports. Customers for Uganda's dairy products—particularly those in the informal market—appear to make few demands on sellers. They accept adulterated products containing added water or disease organisms because those products sell at a low price. Customers in the formal market also appear less demanding than those found in many other countries. For example, they will accept fluid milk sold in the formal market with a three to four day shelf life while customers in Western Europe or the U.S. routinely buy fluid milk with a shelf life of up to two weeks. If Uganda's domestic customers for dairy products demanded better quality, the industry would provide such products. The higher quality products would be welcomed by customers in the domestic market and also might be competitive as export products in neighboring countries.

Uganda's DDA has stepped up efforts to enforce quality and safety standards for dairy products, but

adulteration and other quality-impairing practices are so widespread that the agency lacks the resources to improve product quality and safety to levels found in many other countries. Processors themselves could put in place measures to improve product quality and safety standards. Processors could adopt rapid, on-the-spot testing (with a Lactoscan or similar devices) at relatively small cost. Such tools would enable processors to develop milk pricing incentives for fat, protein and high sanitary standards that would encourage producers to improve milk quality. With these in place, the DDA could then assume the less resource-demanding task of monitoring the actions of processors to see that quality and safety of products are maintained. However, before most processors would assume the key role of marketing high-quality products at all times, they would need stronger incentives from consumers to do so.

Uganda's dairy industry needs stronger supporting clusters of industries and agencies. A viable support cluster might include veterinary services, university education programs and agricultural extension services supporting the dairy industry, artificial insemination companies, dairy equipment companies and dairy product packaging companies. Certain components for a viable cluster already exist in Uganda, but the overall cluster needs to be strengthened. For example, the authors heard calls from a number of industry people for better access to affordable dairy equipment—e.g., milk cooling tanks—and access to more affordable dairy product packaging materials.

The last two points probably are less important than the first three for Uganda's dairy industry. Uganda's government does not appear to exert negative interference in factor and currency markets. The government does need to take action on the long-delayed privatization of the Dairy Corporation—either to privatize the Corporation or withdraw the privatization initiative and strengthen the parastatal. There is probably no need for a more aggressive antitrust policy in the dairy industry.

Processing Facilities to Handle Seasonal Milk Surpluses

For reasons noted earlier, Uganda's dairy industry needs processing facilities to handle milk surpluses

during the rainy seasons. The payoff could be large for such facilities since, during times of peak seasonal surpluses, the milk commands low prices or must be disposed of for little or no return to farmers. Processing facilities that have been considered include plants to process UHT milk, ghee, butter, milk powders and hard cheese.

A milk powder plant might be constructed in Uganda to produce skim milk powder or whole milk powder, products that could be stored to produce useful reserves for enhancing food security. Milk powder could also be sold in international markets. Such a plant would be a high risk venture. Internationally competitive milk powder plants such as those operating in New Zealand are large and capable of processing millions of liters of milk per month. It is doubtful whether the capital could be raised for construction of such a plant in Uganda. Moreover, Uganda's seasonal milk surpluses would not provide the steady throughput of milk needed to make such a plant efficient. Butter and cheese plants are possibilities but they would require additions to the cold chain to keep the stored products in saleable condition. A large-capacity cold chain does not currently exist in Uganda. In addition, hard cheeses are not widely consumed in the country.

UHT milk probably holds the greatest promise since there are potential export markets for this product. Moreover, several of Uganda's dairy processors have experience in producing UHT milk.

Cooperatives in western Uganda could probably use a new UHT plant to advantage. UHT milk from such a plant might be sold domestically or exported to Rwanda and the Democratic Republic of the Congo. For such exports, major savings in transportation costs could be realized from processing the UHT milk in western Uganda rather than in Kampala.

The challenge the western Uganda cooperatives face is to obtain the capital needed for construction of a viable UHT plant. Interest costs are high in Uganda—15 to 20 percent or more. While farmers could contribute modestly to the capital pool needed for construction of a plant, it is doubtful whether they could shoulder a significant portion of the burden for securing the capital needed for plant construction. This leaves few options, but foreign investment might be attracted for construction of a plant producing UHT milk for export. The foreign direct investment would be more likely to materialize if the investor was assured of a steady supply of high-quality milk for the plant.

RECOMMENDATIONS

The study reveals that many in Uganda's dairy industry have an accurate view of challenges facing the industry. This was disclosed clearly in the DDA's comments describing Uganda as having a small dairy market, weak processing sector and an aggressive informal market, characteristics that gave rise to several important challenges noted earlier. However, leaders of Uganda's dairy industry and policymakers seem less certain about how to address challenges and foster profitable development of the dairy industry. This brief list of recommendations and accompanying implementation procedures suggests priorities, ranked in order of importance.

Recommendation No. 1: Producer and Processor Incentives

Establish measures to give producers and processors incentives to produce higher quality milk and

dairy products. Part of the current problem with milk quality occurs because Uganda's dairy farmers are paid on the basis of volume not on the basis of quality or value of milk components. This pricing practice gives farmers incentives to water milk and devote less attention to product quality than is common in many other countries. Processor efforts to improve finished product quality are also hampered by the substandard raw product they receive from producers.

What would be the appropriate incentives? Initially, one or more processors interested in securing raw milk of higher quality could provide price incentives to a group of producers who would be paid higher prices for milk that contains no added water and exhibits low bacteria counts. Manufacturers of high-quality dairy products would be positioned to pay higher prices for milk because they could share with farmers the price premiums they receive from consumers for high-quality dairy products. The processor using the price incen-

tives would, of course, find it necessary to employ accurate tests to detect added water and measure bacteria levels. The price incentives, if sufficiently high, would have an important demonstration effect that would encourage other processors and producers to follow suit.

If producers respond positively to incentives to produce higher quality milk, then additional processors could introduce milk component pricing plans for dairy farmers that reward quality milk that contains no added water and no antibiotic residues, contains higher than average butterfat content and contains higher than average protein content. Producers of butter and hard cheeses would obtain a higher product yield from milk of higher than average butterfat and protein content. Processors using component pricing systems would need sophisticated testing equipment, such as a Lactoscan device, to identify producer milk of good quality.

Paramount Dairy, a Mbarara-based producer of hard cheeses for sale to upscale supermarkets and hotels in the Kampala area, represents a firm that is well situated to introduce a program that provides higher prices to producers of quality milk containing higher than average percentages of butterfat and protein. Currently, Paramount Dairy only purchases milk from suppliers whose milk contains no antibiotic residues. Producers who abide by the need to avoid antibiotic residues in their milk—and who are undoubtedly rewarded financially for this practice—are likely to be receptive to additional quality-based incentives and premium prices for milk containing higher than average percentages of butterfat and protein. The higher cheese yields that Paramount Dairy would obtain from milk of higher than average butterfat and protein content would allow the firm to pay premium prices to the firm's producer-suppliers.

Unfortunately, plans to introduce quality incentives for milk producers are complicated because there is no guarantee that a strong customer base exists in Uganda for high-quality, premium-priced dairy products. How might a processor test the market for high-quality dairy products? A first step could be for a quality-conscious processor to work with a supermarket located in a relatively high income area of Kampala. The processor and the supermarket might team with Land O'Lakes or

a Ugandan producer organization to see that a sound quality chain is maintained from farms to the processor's plant. The processor and the supermarket could then strongly promote genuinely high-quality, long shelf life, premium-priced dairy products. If demand for high-quality is real, this approach would build brand loyalty, resulting in expanded sales and the ability to pay a higher price for high-quality farm milk.

If price incentives extended to dairy farmers for producing higher quality milk fail to generate suitable results, then processors may find it profitable to develop dairy farms of their own to obtain milk of the needed quality. The White Nile Dairy of Jinja has pursued this strategy. Producing some of the firm's needed raw product and buying additional raw product on the open market is a widely used strategy in many industries. This practice, referred to as tapered integration, helps the firm obtain raw materials of the needed quality and specification at acceptable prices.

In summary, processors who obtain high-quality raw milk and produce high-quality finished products have a chance to develop an appreciative customer following. This could be a first step in developing the high-quality finished products that will produce demanding customers in the domestic market. This, in turn, could produce profitable payoffs for Uganda's dairy industry by expanding opportunities for dairy exports.

Recommendation No. 2: Resolve Dairy Corporation's Status

The Finance Ministry should take steps to privatize the Dairy Corporation or temporarily terminate the privatization initiative. Leaving the Dairy Corporation in limbo has serious negative effects. Planning regarding major personnel decisions, changes in the firm's strategies and operations, and even decisions regarding the provision of spare parts for bulking stations leased by the Dairy Corporation are not taking place.

If privatization will not be feasible within a finite number of months, the Finance Ministry should announce this fact and provide funds for shoring up the firm's operations as a step toward making the organization more attractive as a candidate for privatization at a later date.

Recommendation No. 3: Expand School Milk Program

The school milk program should be expanded. If budget constraints continue to thwart such an effort, then other steps should be taken to expand consumption of school milk. For example, a milk promotion program could be expanded to encourage a modestly larger number of parents to support school milk programs financially.

Recommendation No. 4: Focus Land O'Lakes Initiatives

Initiatives undertaken by Land O'Lakes should focus more heavily on marketing. Land O'Lakes points out that it has put effort into improving markets for Uganda's milk and dairy products. However, there is disagreement between many in the industry and Land O'Lakes over the amount of emphasis that the cooperative puts on marketing. Thus, there were frequent recommendations from farmers, industry groups, and the State Minister of Agriculture, Animal Industry and Fisheries, all calling for more marketing efforts by Land O'Lakes. Efforts by Land O'Lakes to help Ugandan dairy firms with construction of plant facilities to handle seasonal milk surpluses, and additional assistance with expanding dairy exports would be particularly helpful.

Recommendation No. 5: Clarify DDA Priorities

Uganda's Dairy Development Authority should establish clearer priorities, initially emphasizing efforts to improve milk quality. The agency currently appears to be trying to strengthen the dairy industry by actions on multiple fronts. It does not appear to have the resources needed for such multi-front activities.

Recommendation No. 6: Establish an Export Market Authority

Uganda's dairy industry and the government should establish an export market authority whose priority would be to improve milk quality standards for exports and develop dairy export markets in neighboring countries in East Africa. Opportunities exist for expanded dairy exports to neighboring countries and exports could provide badly needed capital for developing Uganda's dairy industry. The tasks of locating potential customers, developing high-quality products and assuring a consistent supply of product for foreign customers may exceed the resources of any one private company in Uganda. Thus, joint efforts by two or more firms, with help from Uganda's government for facilitating consistently high-quality exports, would increase the chances that the export market authority would be a viable concern.

Recommendation No. 7: Collect Better Statistics

The Government of Uganda should establish mechanisms to produce better statistics for the country's dairy industry. It is difficult for farmers, processors and policymakers to make sound decisions relating to the nation's dairy industry on the basis of currently available statistics, which are sometimes conflicting and of doubtful reliability.

These recommendations call mainly for basic improvements in milk quality and additions to plant capacity for producing storable dairy products to handle seasonal milk surpluses. These measures would improve nutrition, enhance food security and provide a critically needed foundation for additional profitable improvements in the industry.

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