

Tanzania smallholder dairy value chain development: Situation analysis and trends



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Tanzania smallholder dairy value chain development: Situation analysis and trends

Hikuepi Katjuongua and Signe Nelgen




International Livestock Research Institute (ILRI)

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Acronyms

AI	Artificial insemination
ASF	African swine fever
CBPP	Contagious bovine pleuropneumonia
CODAFA	Coastal Dairy Farmers Association
DDF	Dairy Development Forum
EAC	East African community
ECF	East coast fever
FAO	Food Agriculture Organization of the United Nations
FMD	Foot and mouth disease
GDP	Gross domestic product
HBU	Heifer-breeding units
ILRI	International Livestock Research Institute
LGA	Local government authorities
LMU	Livestock multiplication units
LSMS-ISA	Living Standard Measurement Study-Integrated Surveys on Agriculture
MAFAP	Monitoring African Food and Agricultural Policies
MLFD	Ministry of Livestock Fishery Development
NAIC	National Artificial Insemination Centre
NBS	National Bureau of Statistics
NGO	Non-governmental organization
PPR	<i>Peste des petits ruminants</i>

RVF	Rift Valley fever
SACCO	Savings and credit cooperatives
TAD	Transboundary animal diseases
TALIRI	Tanzania Livestock Research Institute
TBS	Tanzania Bureau of Standards
TDB	Tanzania Dairy Board
TFDA	Tanzania Food, Drugs and Cosmetics Authority
TLU	Tropical livestock unit
TSZ	Tanzania Shorthorn Zebu
TVLA	Tanzania Veterinary Laboratory Agency
TZNPS	Tanzania National Panel Survey
TZS	Tanzanian shilling
UHT	Ultra-high temperature
VCT	Veterinary Council of Tanzania
VPHFS	Veterinary Public Health and Feed and Food Safety
WFP	World Food Programme
ZARDEF	Zonal Agricultural Research and Development Fund
ZVC	Zonal veterinary centres

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Executive summary

The dairy sector in Tanzania has an enormous potential to reduce poverty:

- Tanzania's gross domestic product (GDP) growth rate has been between 6-7.8% per annum in the last 10 years. The livestock sector's share of total GDP is approximately 5.4%, and it accounts for 28-30% of value added. On the other hand, the dairy sector accounts for 30% of the livestock contribution to agricultural GDP. Considering that Tanzania has the second largest cattle population in Eastern Africa and the third largest in Africa (estimated at 21 million and mostly owned by smallholders and pastoralists), the country's dairy sector has a high potential in contributing to poverty reduction and rural development.
- Most rural households own livestock and are involved in agricultural activities: 60% of these households on average derive 22% of their income from livestock activities. Women's participation in livestock activities tends to be oriented towards the selling of milk.
- The value of per capita of urban livestock and dairy product consumption is twice than those of rural households. This difference in urban and rural livestock product consumption provides an opportunity for rural livestock producers to increase their production to serve Tanzania's growing population and demand for animal-sourced products.
- Compared to other countries in the region, Tanzania's current annual milk consumption of 45 litres per capita is low. To encourage milk consumption, the country has to support various promotional events and programs, including school feeding. But ultimately, in general, it is the increase in disposable income that can have a significant impact on the consumption of dairy and animal-sourced products.
- Markets of fluid milk remain largely informal and fragmented. The formal market, characterized by a low level of capacity utilization and vertical coordination, is composed of a number of processors that face various challenges, including seasonality of milk supply, power outages, competition from imported milk products and low domestic consumption of milk and dairy products. Meanwhile, the informal market dominates in the marketing of fluid milk consumption.
- While there are opportunities for many livestock keepers to meet the growing demand for milk and dairy products, there also are several challenges related to productivity and consumption, which include the following:

High incidence of animal diseases and limited access to veterinary services. The government-priority animal diseases related to cattle include contagious bovine pleuropneumonia (CBPP), east coast fever and brucellosis. Vaccination rates are low, especially among poor female-headed households. Since there are few animal healthcare providers in the country, preventive animal health services and infrastructure are poor and underfunded. Hence, the process of reporting diseases needs to be simplified, and it is imperative to improve the coordination between local and central government structures for more efficient disease control.

Low proportion of high milk-yielding breeds. Cattle bred for milk production are relatively few in Tanzania. Thus, crossbreeding of pure milk breeds with indigenous cattle has been a common practice since mixed-breed cattle

produce more milk than the indigenous ones. However, mixed-breed cattle make up only 3% of the national herd and produce about 30% of the milk demand. The use of artificial insemination (AI) services to increase the level of crossbreeding remains low. And although cheaper, the quality of publicly provided semen is reportedly poor. There is a dearth of information and data on the performance of AI services in terms of actual conception rates and the cost of the services. The role of the private sector, non-governmental organizations (NGOs), farmer and community-level organizations in the administration and provision of AI services needs to be examined.

Insufficient feed quantity and quality. The private sector is now beginning to play an important role in the manufacturing of compound feed. Given the high demand for feed, especially in the dry season, there is a need to establish a certification scheme to promote trust and better coordination in the feed industry. Currently, there is limited training and certification of small-scale forage and seed producers. In extensive pastoralist systems, better rangeland management is important.

Limited access to credit. Not surprisingly, access to credit is very low among rural livestock producers, as is participation in credit and savings schemes. Living Standard Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) data show that only 6% of households have received credit, and 5% are members of a savings scheme. There is a need to support micro-credit organizations and to build linkages between self-help groups and micro-credit institutions.

Increasing quality and coverage of extension delivery. Extension delivery plays an important role in a livestock keeper's ability to access animal disease and production management information and services. While extension service availability is higher compared to other livestock support services, such as credit, there is a need to (1) improve the quality of extension by training and meeting needs of extension officers and (2) to increase the coverage of extension delivery to poorer rural households.

High regional non-tariff barriers. While there are no tariff barriers within the East African community (EAC), non-tariff barriers remain a hindrance to regional trade in dairy products. In addition, the poor quality of products and the lack of a traceability system limit exports of Tanzanian dairy products.

Low level of consumption of milk and dairy products. At 45 litres/capita per year, there is a general consensus among dairy industry stakeholders that more needs to be done to increase consumption of milk and dairy products in order for the industry to remain viable and have an impact on poverty reduction.

Overall, a two-pronged approach addressing both productivity and consumption constraints is necessary to develop a viable pro-poor dairy sector in Tanzania. Without the creation of strong linkages among input and output markets, the piecemeal approach that focuses on production or marketing in isolation will not have a significant impact on livelihoods. Equally important is to build a supportive policy and regulatory environment.



Background

The demand for animal protein in the east African region is increasing due to rising incomes and population growth. This has opened opportunities for upgrading dairy sector services, facilitating business development and marketing, and for smallholder dairy farmers to improve their livelihoods. Dairy has been identified as an important target value chain for Tanzania because of its potential to increase the income of smallholder livestock producers, in line with ILRI's goal of improving livestock's contribution to poverty reduction.

This report aims to provide information on the status of Tanzania's dairy industry. The report examines production, consumption, trade, inputs and services, value addition and marketing, competitiveness, dairy development strategies and opportunities for pro-poor dairy value chain development. The report is meant to serve as a guide to dairy stakeholders on the different strategies that will lead to the development of the dairy sector. It provides a broad overview of the opportunities and challenges facing the dairy industry.

Since detailed data and analyses are necessary to formulate specific interventions, this report, however, only provides broad recommendations to guide further research and debate on key focal areas to improve the performance of the dairy value chain in Tanzania. The analysis here is based on secondary data, interviews with key informants in the dairy industry, including farmers, researchers and government policymakers.



Economy and population

Tanzania's economy has grown steadily in the last 10 years with growth rates between 6-7.8% per annum. Although it is still primarily an agriculture-based economy, the shares of the industrial and service sectors in total GDP are increasing. Livestock production contributed 4.7% of the GDP in 2012 according to the Ministry of Agriculture Food Security and Cooperatives. Furthermore, 30% of livestock's contribution to GDP comes from the dairy sector (Tampa 2011). The livestock sector grew at a slower rate of 3.2% in 2009, but increased to 5.4% in 2010. Hence, overall, the livestock sector's contribution to agricultural GDP is increasing.

Tanzania's population grew from 25.5 million in 1990 to 34 million in 2000, and it reached over 48 million in 2013. The average household size has nearly five people. Currently, over 60% of Tanzania's 48 million people live in rural areas. Of the 885,800 km² of land that the country covers, 373,000 km² is agricultural land. According to the agricultural census carried out by the Tanzania Government (2007/08), 2.4 million households are raising a total number of 43.8 million animals, of which 21.3 million are cattle. Most of the cattle-keeping households keep between 1 to 10 cattle, and a mere 120,014 of the 21.3 million cattle are kept on large-scale farms.



Demand for livestock products

The demand for dairy and other livestock products is increasing, albeit at a slow pace. Commonly consumed, dairy products comprise almost 50% of the total expenditure on livestock products. Wealthier households purchase a greater share for their livestock products compared to relatively poor households, whose source is largely from their own production (Covarrubias 2013).

Urban consumers are greater consumers of livestock products.

Table 1 shows that consumers in urban areas consume nearly twice the amount of meat per person than those living in rural areas (12kg vs. 6.9kg). Dairy and poultry consumption is nearly equal, but the per capita value of the products is almost double in urban areas as shown in Table 2. Based on LSMS-ISA data for Tanzania, the value of dairy products and other livestock products is higher in urban areas since almost all of the livestock and dairy products in urban areas are purchased (with only 2% share home produced).

Table 1: Rural and urban household livestock product consumption

Per capita consumption	Urban	Rural
Meat (kg)	12.35	6.97
Poultry (kg)	3.52	3.33
Dairy (litre)	15.61	14.64
Eggs (kg)	2.62	0.72
N	1200	2055

Source: Covarrubias *et al.* (2012)

Table 2: Per capita value of dairy and livestock product consumption

Product	Urban (TZS)	Rural (TZS)
Dairy	12,021	7819
Fresh milk	9909	5414
Other dairy products	1012	1985
Butter	1100	420
Total value	71,822	36,541

Source: Covarrubias *et al.* (2012)

The data further reveal that rural households that do not participate in livestock production purchase a much greater quantity of dairy products. And for those that undertake livestock production, dairy products account for more than 33% of livestock products consumed.

Dairy output has grown, but at almost the same rate as population growth.

The Tanzanian population has almost doubled since 1980, but overall food production has not kept pace with its population growth. Table 3 shows the evolution of food consumption in Tanzania from 1980 to 2007. It highlights the shares of animal-sourced food and dairy products. The quantity of dairy output (milk and butter) grew by about 4.4%

per annum, while population grew by 4.5%. Consequently, some of the per capita food consumption indicators have been constant. Milk intake in 2007 was at about 24kg per person, a level of consumption attained in 1980. Currently, milk intake is 45 litres /person per year. Again, more raw milk is consumed in the informal market and at home, which is not captured well in most data sets.

Table 3: Trends on share of milk in total diet in Tanzania (1980-07)

	Population (million)	Food supply quantity*				
		'000 tonnes **	Kg/capita per year**	Kcal/capita per day	Protein (g/capita per day)	Fat (g/capita per day)
1980						
Animal products		-	-	136	10	9
Milk & butter		441	24	43	2	3
Grand total	19	-	-	2220	55	31
1990						
Animal products		-	-	149	12	10
Milk & butter		598	24	39	2	2
Grand total	25	-	-	2121	53	31
2000						
Animal products		-	-	121	9	8
Milk & butter		814	24	43	2	3
Grand total	34	-	-	1929	50	29
2007						
Animal products		-	-	109	8	7
Milk & butter		959	23	42	2	2
Grand total	41	-	-	2032	49	33

Source: Own calculations using data from Food Agriculture Organization of the United Nations (FAO) database

* Includes imports

** For aggregate categories (i.e. grand total and animal products), quantities supplied (tonnes and kg/capita per year) are not available.

The data do not include most of the milk consumed on the street, on farms and in informal markets. Most of the milk is sold and consumed with limited or no value addition partly due to high production and processing costs. According to a recent household budget survey (NBS 2007), less than 1% of households consume processed milk. Currently, there are about 50-62 milk-processing plants, the majority of which are smallscale processors that process less than 1000 litres of milk a day. In 2011, milk-processing capacity in Tanzania reached 112,400 litres per day.

Price per calorie affects consumption of livestock products.

Pauw and Thurlow (2010) computed the price and quantity relationships for different food products and shares of different food products in the total household budget among food-insecure rural and urban households. After aggregating food items into broader groups, they summarized the shares of calories available from the different food groups as shown in Table 4. The first column of the table indicates that per 100g of food served, animal products contain 259 calories, while the average for all agricultural products is 206 calories. The second column displays information on the price of 100 calories from the different products and the average for all agricultural products. The average price of 100 kcal for all agricultural products is 5.9 Tanzanian shillings (TZS). However, the corresponding price for animal products is TZS 22.4. This shows that animal-sourced food in Tanzania is about four times more expensive compared to the rest of the agricultural products. The relatively high cost of animal products discourages poorer households from consuming them. Since most rural food-insecure households are relatively poorer than the urban food-insecure households, the former spend a larger proportion of their budget on non-animal-sourced food

than the latter. As such, the share of animal products among poor rural households is 4.6%, while that of the poor urban household is 7.3%.

Table 4: Calories per serving, price per kilocalorie and urban-rural calorie composition

	Calories per serving (i.e. 100g)	Price per 100 kcal (TZS)	Share of daily per capita caloric availability among food-insecure households (%)	
			Urban areas	Rural areas
All food products		6.6	100.0	100.0
Agricultural products	206	5.9	35.9	45.9
Animal products	259	22.4	7.3	4.6
Cattle	252	20.7	5.0	2.3
Poultry	226	37.4	0.4	0.3
Other livestock	338	16.7	0.3	1.0
Fish	169	25.6	1.6	0.9
Processed foods	232	6.1	51.8	48.1
Prepared meals	91	18	5.0	1.4

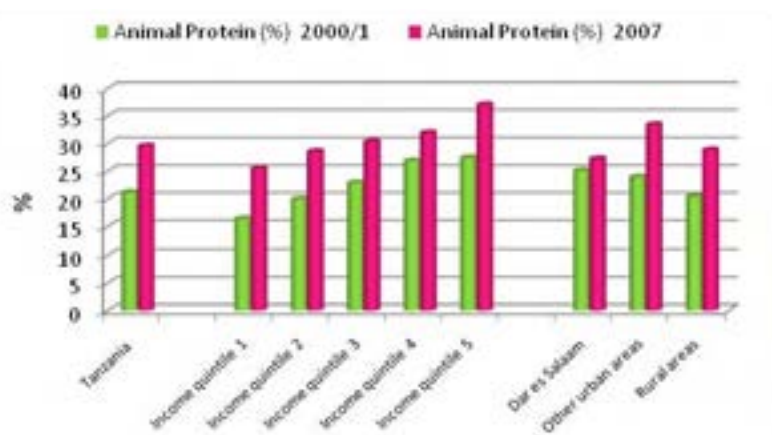
Source: Pauw and Thurlow (2010)

Overall, animal-sourced protein intake has increased.

Figure 1 shows changes in animal protein as a percentage of total protein intake between 2001 and 2007 for different income groups and by location. On average, the total share of animal-sourced protein increased from about 20% to about 30%. By 2001, the share of animal-sourced protein was 15% for the first quintile income group, while the corresponding share for the fifth quintile was over 25%, showing more than a 10% difference between the top and bottom income groups. By 2007, the share of animal protein rose to 25% for the first quintile income group and 35% for the fifth quintile. Thus, the pattern of changes in animal protein consumption by income groups indicates that the high-income groups not only had relatively larger shares in 2001, but they also experienced higher increase in the share of animal protein in their food between 2001 and 2007.

The urban-rural disparity in terms of changes in the share of animal protein shows a somewhat complicated picture. In 2001, the share of animal protein for residents in the capital, Dar es Salaam, was just under 25%, slightly higher than the corresponding average share for the other urban areas. The rural areas lagged behind with just under 20%. However, the centre-periphery disparity seems to have changed in 2007, with the share in Dar es Salaam barely increasing from the level attained in 2001, but those for the other urban areas and rural areas exceeding that of Dar es Salaam.

Figure 1: Share of animal protein in total protein energy contribution.



Source: NBS (2010)

Tanzania lags behind other countries in consumption of milk and other dairy products.

Per capita milk consumption is estimated to be 45kg/annum. Kaijage (2004) noted that the overall per capita milk consumption in Tanzania is low compared to Kenya (80kg/annum) and to the world average (105kg/annum). The global recommended level by the Food Agriculture Organization of the United Nations (FAO) is 200 litres/ head per year. Other countries with a high average annual per capita consumption level of milk include India (68kg), USA (261kg) and Australia (248kg). But researchers (including Delgado and Rosegrant 2001; Kumar *et al.* 2007) projected that the demand for livestock and dairy products will increase substantially by 2020, primarily in developing countries, with the demand for liquid milk expected to increase from 83kg in 2003 to 132kg in 2020 and 138kg in 2025. Dairy processors hope to see Tanzanian's annual consumption of milk increase to 100 litres/ person.

There are various programs promoting the consumption of dairy products.

Tanzanians do not have a strong culture of milk consumption. As such, there have been efforts to promote it. According to Kurwijila (2006), the Coastal Dairy Farmers Association (CODAFA) initiated the first milk-consumption promotion in 1997. The initiative in Tanzania followed a worldwide trend to promote milk as a healthy and nutritious food. In addition, in collaboration with other SADC countries, Tanzania observes a milk promotion week every June. A school-feeding program was launched in 2002, which at present is implemented in Kilimanjaro, Arusha, Dar es Salaam and Tanga regions. School milk-feeding programs are important in getting children from a young age grow to be become active consumers; thus, a large public school milk-feeding program may increase consumption. Most importantly, some researchers (Lien *et al.* 2009) showed that milk and dairy consumption improves children's nutrition and health, which in turn positively contributes to school attendance.



Dairy as a pro-poor sector

The Tanzanian dairy sector can be an important branch of the country's economy that is particularly pro-poor. The dairy sector and livestock industry in general present an important avenue for addressing poverty and rural development by creating income and employment opportunities. The sector is characterized by a substantially large participation of millions of smallholders. Specifically, its potential is because of the following factors:

- a. *The majority of rural households in Tanzania own livestock.* According to the national panel survey (2009), 60% of rural households reported some income from livestock activities by earning on average 22% of their total household income. Furthermore, the share of rural households participating in livestock activities increases with welfare (measured in expenditure quintiles).
- b. *Per capita urban livestock product consumption is twice that of rural households.* As mentioned previously, consumption of dairy and other livestock products in urban households is twice than that in rural households. While the share of food in total household expenditures decreases with rising incomes, total household expenditures on livestock products rises as income increases. The difference in urban and rural livestock consumption levels and income patterns is an opportunity for livestock producers to increase production and serve the growing population in urban and peri-urban areas.
- c. *Women's participation in livestock activities tends to be oriented towards selling milk.* While women in Tanzania tend to own fewer tropical livestock units (TLUs) than men and provide on average less of their labour time to animal production and husbandry, they tend to allocate more time to the sale of milk (Covarrubias 2013). Consistent with Covarrubias, a baseline data of 634 cattle-keeping households in Tanzania (ILRI 2013) showed that women report greater participation in sale of milk and allocate higher labour in selling milk than men in Kilosa, Handeni and Mvomero districts. Furthermore, Covarrubias *et al.* (2012) reported that female managers of livestock tend to be more commercially oriented. Although the data do not capture decision making over money from milk sales, the high share of female-headed households selling livestock products, including milk, is a potential pathway out of poverty.

Key points

- Overall demand of milk and meat in Tanzania is increasing, albeit at a slow rate; intake of animal-sourced protein has increased.
- Urban residents consume more of livestock products, but dairy consumption is almost equal in both rural and urban areas.
- In rural areas, most of the milk is consumed at home. Total value of expenditure on fresh milk and dairy products is double in urban areas compared to rural areas.
- Dairy output has grown, but it has not kept pace with population growth due to low productivity, especially in the traditional sector.
- The dairy sector is promising in terms of addressing poverty reduction and promoting rural development. A substantial share of livestock ownership is concentrated in rural households in the smallholder system, and the consumption of milk and livestock products is in urban areas. Also, many rural women are engaged in selling milk.
- There are opportunities for participation in the dairy sector with greater distributional impacts through employment and income generation. But for these opportunities to materialize, addressing constraints related to feed, improved access to breeding services, animal health and credit is necessary.



Milk production

Tanzania's cattle population doubled between 1965 and 2012, reaching over 21 million in 2012 and growing at 2.1% per annum (Table 5). Milk cows were 17% of the total herd in 1965 and increased to 35% in 2010. Milk yield per cow per year grew from 160kg in 1965 to 239kg in 2010, with an average annual growth rate of 1.1%. Milk production increased from 710,000 tonnes (t) in 2000 to 1,853,099t in 2012 (FAO 2012). Of the 1.74 billion litres produced in 2011, only 608 million litres came from high-yielding crossbred cows and 1.13 billion litres from traditional breeds.

Table 5: Trends in milk production and productivity (1965-2010)

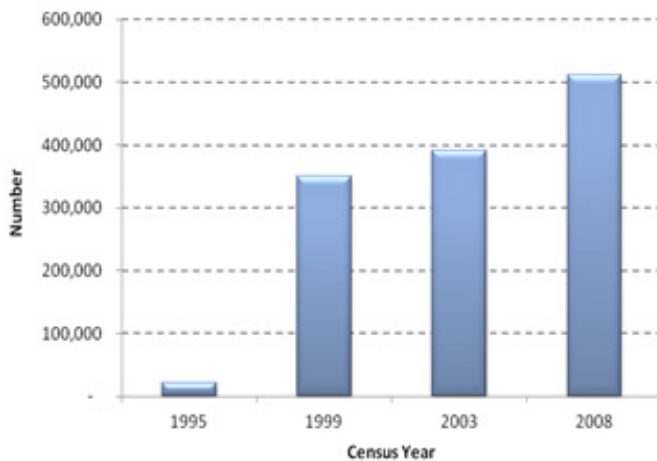
	Cattle population		Milk production	
	Total (million)	Milk cows (%)	Quantity(000t)	Yield (kg/cow per year)
1965	10	17	267	160
1975	11	18	321	160
1985	13	21	430	160
1995	16	21	590	182
2005	18	33	1386	239
2010	20	35	1650	239

Source: Computed using data from FAO statistical database, <http://faostat.fao.org/site/569>

The data suggest that productivity was stagnant for much of the 1960s and 1970s, but started to increase from the mid-1980s.

Kurwijila (2006) observed that this change occurred due to combined efforts of the government and development partners that have led to the expansion of the improved dairy herd from 143,000 in 1984 to over 385,100 in 2002, which were kept in over 129,000 smallholder farms. In 2008, there were about 500,000 improved dairy cattle on both smallholder and commercial farms (Figure 3). The southern highlands of Tanzania (administrative regions Mbeya, Rukwa, Ruvuma and Iringa) have a relatively larger proportion (14.5%) of the country's improved dairy cattle population (Kaijage 2004). The estimated share of improved breeds in total milk supply ranges from 20-30% of total milk supply (Kaijage 2004; Kurwijila 2006).

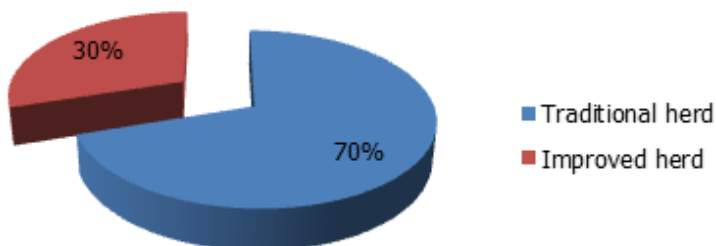
Figure 2: Improved dairy population trend, 1995-2008.



Source: Kurwijila (2006)

There are mainly two dairy farming systems in Tanzania: a traditional system based on extensive grazing, and a more sedentary and modern system using crossbred dairy cattle. Figure 3 depicts a breakdown of these two systems. Dairy farming is further subdivided into more specific subsystems, such as smallholder dairy farming system integrated with perennial crops (banana and coffee), smallholder dairy farming system integrated with annual crops, peri-urban dairy in coastal belt, traditional (semi-sedentary/transhumant) system, specialized medium-scale dairy farms with little crop cultivation and large-scale and estate dairy farms.

Figure 3: Milk production by type of cow (2011).



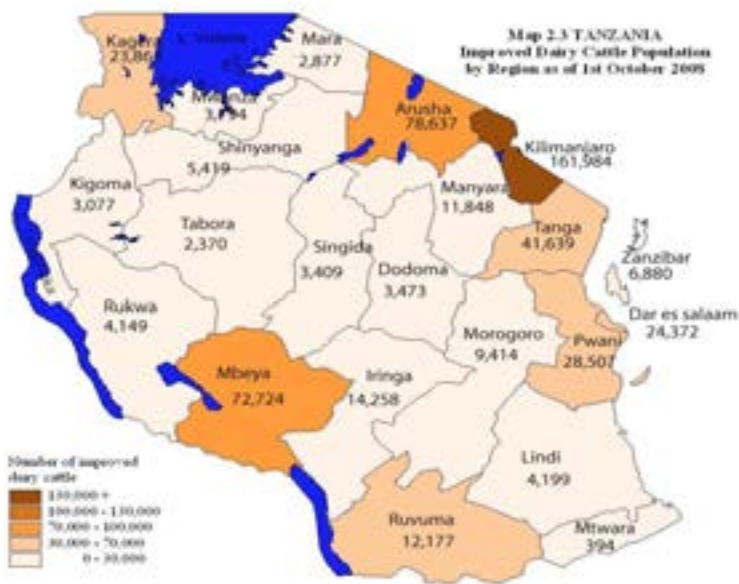
Source: Tanzania Dairy Board

The traditional system accounts for more than 75% of total milk production in Tanzania. The traditional herd is estimated at 21.1 million heads and located mainly in the north and west of the country. The system is characterized by low productivity per cow and per hectare, but high return per unit of invested money. This environment allows for productivity enhancement and large future gains through investment in the traditional dairy sector in Tanzania.

Most improved breeds are to be found in Arusha with 78,638 heads, Kilimanjaro with 161,984 heads and Mbeya with 72,724 heads. Figure 4 shows the regional distributions of improved cattle breeds. In comparison, less than 10,000 were found in the other regions in the 2008 survey.

The growth rate for improved dairy cattle from 1995 to 2008 was 100% per year. The highest growth rate, which was 308%, was experienced between 1995 and 1999. Thereafter, it declined to 2% a year (1999-03) and increased again to 6% (2003-08). This large increase, however, was attributed to the lack of an up-to-date and adequate sampling framework for designing agricultural censuses and surveys. For instance, the National Bureau of Statistics (NBS) sampled 570 villages in 1995, then 1200 villages in 1999 and 3192 villages in 2008. The national master sample is based on households and does not reflect the regional distribution of livestock in the country.

Figure 4: Regional distribution of dairy cattle in Tanzania as of 2008.



Source: National Bureau of Statistics

The 2011-12 production of milk was 1.85 billion litres of which more than 65% came from indigenous cattle kept extensively (MLFD 2012). According to the Ministry of Livestock Fishery Development (MLFD), sensitizing farmers on the proper use of land, assisting the livestock keepers to acquire title deeds and reducing high land taxes can reduce conflicts among the livestock keepers and other land users.

Scarcity of feed and limited access to disease control and breeding services constrains milk production.

Diseases in livestock reduce animal productivity and fertility, resulting in limited weight gain and high mortality and morbidity levels. Only few livestock keepers vaccinate their herd, and access to disease-control services in rural households is very limited. The quality and quantity of feed vary significantly due to seasonality affecting milk production, especially in the smallholder extensive production system. The Tanzania National Panel Survey (TZNPS) data revealed that few (20%) livestock keepers purchase fodder. Also, the majority of cattle breeders own low-yielding indigenous breeds. Hence, better access to breeding services to improve productivity through crossbreeding is needed to significantly increase milk production.

The use of inputs in livestock production is low. Using the TZNPS data, Covarrubias *et al.* (2012) reported that overall, only 6% of rural livestock holders hired labour for work on livestock-related activities compared to 14% of larger livestock farmers. Most rural households rely on household members for agricultural labour, while hired labour is more common in crop production.

Gender aspects of livestock production. Previous research (Njuki *et al.* 2011) showed that women tend to own less TLUs than men and that they tend to own more small ruminants and poultry than cattle. Also, women's market participation tends to be oriented towards the sale of milk. The TZNPS data further illuminate the gender aspects of livestock production. The data¹ show that female-headed households own less TLUs than male-headed households; the share of female-headed households who own cattle is 17% compared to 27% of male-headed households. Furthermore, 7% of female-headed households own heifers compared to 12% of male-headed households.

Overall, the TZNPS data show greater inequality in large livestock ownership, including cattle. But the difference could be related to household labour allocation with women preferring to manage livestock that can be kept closer to home

¹ Only 21% of livestock-keeping households in the sample are female-headed households.

and that require less time in supervision. Even in jointly headed households, women are found to be more oriented towards activities related to selling milk. Poorer female-headed households report limited access to inputs for livestock production, including lower shares of purchasing fodder. Covarrubias (2012) noted that for women managing livestock, the values earned from slaughtered livestock and sales of milk are not statistically significant, and for the value of livestock sold alive, female managers earn significantly less than men.

The government is taking initiatives to strengthen the National Artificial Insemination Centre (NAIC).

Encouraging traditional farmers to use improved genetic materials to increase the productivity of traditional livestock is very important. The NAIC is the main source of semen for AI, and the livestock multiplication units (LMUs) are the major source of dairy animals for small-scale farmers. The MLFD is equipping, retooling and restocking farms to produce heifers and bulls, which can be used to improve the traditional sector.

The ratio of processed milk products to total milk production has declined. The quantity of processed cow milk (the sum of skimmed milk, butter and cheese) as a ratio of total milk produced in the country (shown in Table 6) has declined from 15% (1965) to 10% (2010). Table 6 shows trends in Tanzania's dairy processing capacity over four and a half decades. Clearly, dairy-processing activities started on a very small base. For instance, skimmed cow-milk processing started at only 37,100t (1965) and grew to 124,500t (2010). The threefold increase in the quantity of processed skimmed milk, however, does not necessarily indicate that substantial progress has been made in dairy processing during the period.

Table 6: Processed dairy products (000 tonnes) (1965-2010)

	1965	1975	1985	1995	2005	2010
Butter cow milk	0.8	1.7	2.4	3.3	15.0	21.0
Cheese of whole cow milk	0.5	0.6	1.0	1.8	9.0	13.0
Ghee, butter oil of cow milk	0.8	1.0	1.3	1.6	7.4	10.5
Skimmed cow milk	37.1	58.9	80.7	106.4	124.5	124.5
Butter and ghee	1.6	2.7	3.7	4.9	22.4	31.5
Cheese (all kinds)	0.5	0.6	1.0	1.8	9.0	13.0

Source: Computed using data from FAO database

Formal milk processing has declined by more than 80% over the last 15 years, and 13 dairy plants have closed (TAMPA 2011). Most of the processing plants operate at 30% of the installed capacity, resulting in only 105,000 litres processed per day, compared to 496,000 litres in 2009. In 2009, the country had an annual installed capacity to process 325,600 litres per day but operated at an average rate of less than 100,000 litres.

The MLFD formulated a livestock development strategy in 2010 to support the livestock sector, particularly the dairy sector.

This strategy is considered important in supporting smallholder livestock farmers. It identifies four key priority interventions, including (1) improving financial services, (2) increasing incentives for smallholder dairy cattle keepers to participate in the production, (3) processing and (4) marketing of livestock products. The national livestock policy aims to support a more commercial, efficient and regionally and internationally competitive dairy sector in Tanzania (TAMPA 2011; MLFD 2010).

Key points

- Tanzania's cattle population doubled between 1965 and 2012, but productivity remains low.
- The yield per cow has reached 239kg per year in 2010.
- Low-input use, limited access to disease-control services, feed and poor breeds constrain productivity in the dairy sector.
- Traditional dairy farming accounts for more than 75% of total milk production.
- The productivity of improved cattle can be fivefold (or more) compared to traditional breeds.
- The government is taking initiatives to strengthen the NAIC.
- The quantity of processed cow milk as a ratio of total milk produced has declined.
- The regulatory burden contributes to the decline in the competitiveness of the dairy sector.
- Seasonality means that milk availability in the dry season is half of that in the rainy season.
- The dairy sector is recognized in contributing to livelihood of smallholder livestock farmers.
- Poorer female-headed households have limited access to inputs for livestock production, including lower shares of purchasing fodder.



Livestock support services

Livestock support services are important in the development and growth of the dairy sector. However, many researchers (including Covarrubias *et al.* 2012; Sarri *et al.* 2006; Njombe and Msanga 2005) showed that limited access to inputs such as credit, drugs and veterinary services and poor dissemination and uptake of knowledge, are recognized constraints to the development of Tanzania's smallholder livestock and crop sectors. In addition, Covarrubias *et al.* (2012) reported that poorer female-headed households report limited access to inputs for livestock production, including lower vaccination rates, considerably reduced access to extension services and lower shares of purchasing fodder. This section addresses livestock support services in the Tanzania's livestock sector, including (1) animal health and veterinary services, (2) breeding and dairy genetics, (3) feed supply, (4) knowledge systems, (5) access credit and (6) extension services.

Animal health and veterinary services

Animal health is a key element in the productivity and profitability of dairy cows and, in certain cases, impacts human health. This section reviews animal health issue in the dairy and livestock sectors, including (1) disease incidence and (2) animal health infrastructure.

Animal disease incidence and losses

Economic losses experienced by livestock-owning communities can be significant, especially for poor smallholder farmers. Diseases in livestock contribute to economic losses through reduction in animal productivity, reduced fertility and poor feed conversion resulting in limited weight gain and high mortality and morbidity levels. According to the MLFD, the priority animal diseases in Tanzania include CBPP, foot and mouth disease (FMD), *peste des petits ruminants* (PPR), east coast fever (ECF), Newcastle disease, rabies, avian flu and brucellosis. Key informants at the MLFD (2014) noted that PPR was estimated to cost 67.9 million USD in losses because of high mortality rates. Covarrubias *et al.* (2012) reported that CBPP and ECF are cattle diseases most often reported by farmers. Of the 1499 livestock-keeping households captured in the LSMS-ISA data, 17% and 15% reported cases of CBPP and ECF, respectively. The government-priority animal diseases targeted for vaccination and creating awareness include CBPP, African swine fever (ASF) and PPR.

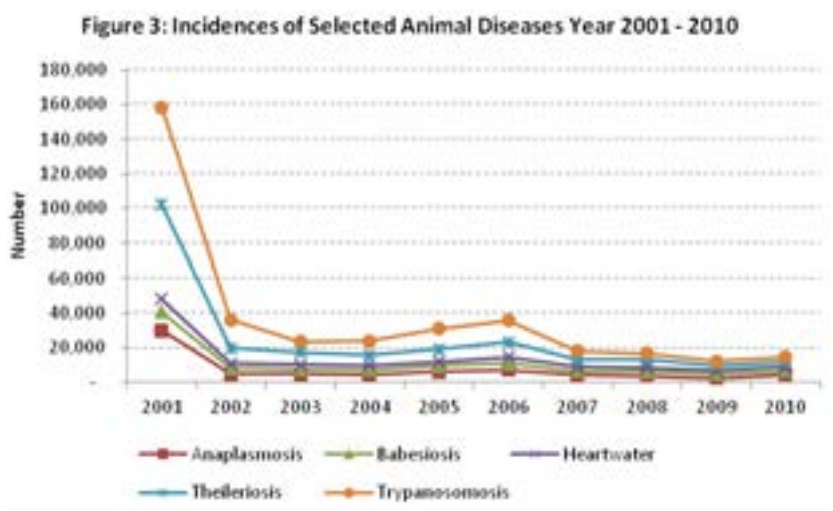
There are 2.7 million households that do not use any methods to control tick-borne diseases. According to the NBS (2008), 2.5 million livestock keepers reported Newcastle disease as a common disease, with above-national-average infection rates being reported in Morogoro, Mbeya, Dar es Salaam, Tanga, Dodoma and Lindi regions. The national report on agricultural census for 2007-08 notes that tick-borne diseases affect approximately 1.9 million (37%) livestock-keeping households, which have the highest incidence in Mara, Manyara, Arusha, Tanga, Tabora, Mwanza, Singida and Dodoma. The report further notes that 60% (about 2.7 million) of households surveyed do not use any method to control tick-borne diseases. It was learned that 30% of households spray, and 6% dip their

livestock as control methods. MLFD notes that tick-borne diseases, mystitis, brucellosis and tuberculosis are among the most important livestock diseases in Tanzania. While deworming shows an increasing trend, it is still low. Based on the 2007-08 census, approximately only **45% of livestock-keeping household deworm their livestock.**

Livestock disease prevalence and inadequate public expenditure on animal healthcare significantly limit the development of the livestock industry. In the tropics—and Tanzania in particular—transboundary animal diseases (TADs), vector and vector-borne diseases, emerging diseases and zoonotic diseases pose a big challenge to livestock production and productivity (Swai *et al.* 2009; Kivaria and Noordhuizen 2009). Most of these diseases continue to persist, but there is little research on their economic impact at national and household levels.

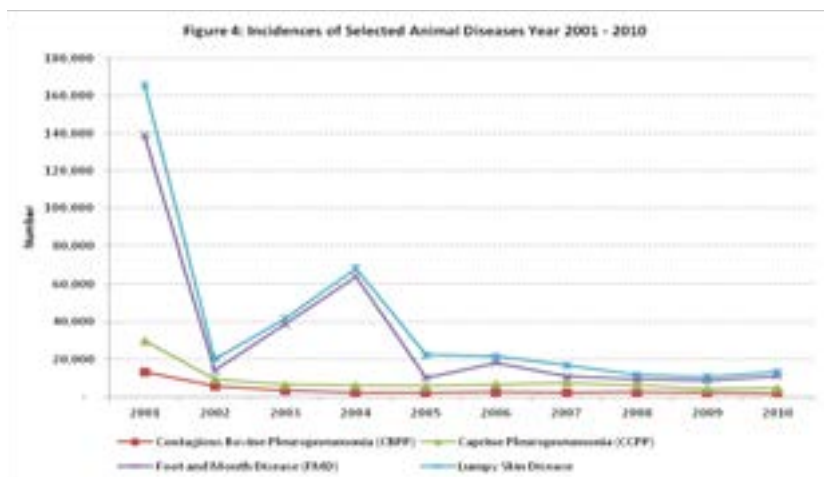
The incidence of animal diseases is unclear because of inconsistent data. Figures 6 and 7 show the trend in the incidence of selected animal diseases. They reveal that outbreaks in these diseases declined significantly from 2001 to 2010. However, it may have been due to many reasons, including poor reporting. The animal diseases reporting system involves many levels—from the village to districts, then to the veterinary investigation centres and finally to the central level. According to MLFD, the reporting of suspected animal diseases is declining, partly because farmers have little incentive to report suspected animal diseases; it takes long for a diagnosis to be confirmed and for treatment to reach farmers.

Figure 5: Major diseases of importance so far reported in the country.



Sources: NBS (2011)

Figure 6: Incidence of selected animal diseases (2001-10).



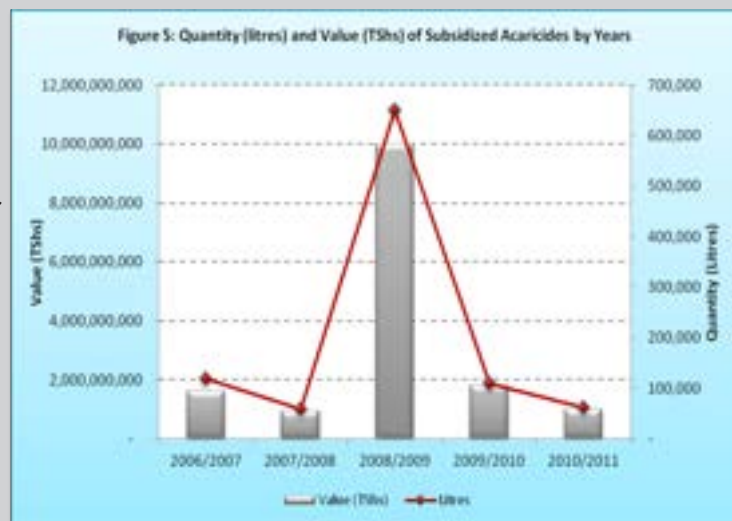
Source: NBS (2011)

Covarrubias *et al.* (2012) noted that a significant number of livestock-keeping households report incidence of animal diseases: 42% of cattle keepers reported incidence of animal diseases. There are government efforts together with other stakeholders to implement control strategies and interventions for various diseases in the different production systems. For example, the government officially announced that Sumbawanga and Nkasi districts in Rukwa were disease-free zones (areas with no incidence of TADs) in an effort to improve veterinary service delivery and to market livestock and livestock products. But there are no control strategies in place for many of these major animal diseases. There is no program for brucellosis, but the government is currently setting up one.

Vaccination rates among livestock-keeping households are low. Again, according to Covarrubias (2012), only 31% of the 11,197 households reported vaccinating their livestock. Vaccination rates are higher for households that have access to extension services than those that do not (51% and 29%, respectively). Hence, Covarrubias (2012) concluded that the prevalence of animal diseases among rural households shows widespread vulnerability of all types of livestock producers to animal disease. Households spent on average TZS 31,401 per year on animal diseases.

Box 1: Expenditure on livestock veterinary services: Acaricides.

One of the major interventions instituted by the government since 2006 to date is the provision of subsidized acaricides in an effort to control ticks and tick-borne diseases. Through the Ministry of Livestock and Fisheries Development (MLFD), a 40% subsidy on acaricides is provided in order to empower livestock farmers to have sustainable dipping. This involves proper delivery system to the target dips so that the impact of the subsidy can be realized. The value and quantity of acaricides provided since 2006-07 (inserted Figure 5) show that 40% of the value is paid by government, and the remaining 60% is paid by the farmer based on the selling price of the acaricides. The impact of the subsidy in tick-borne disease prevalence needs to be examined.



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Animal health infrastructure

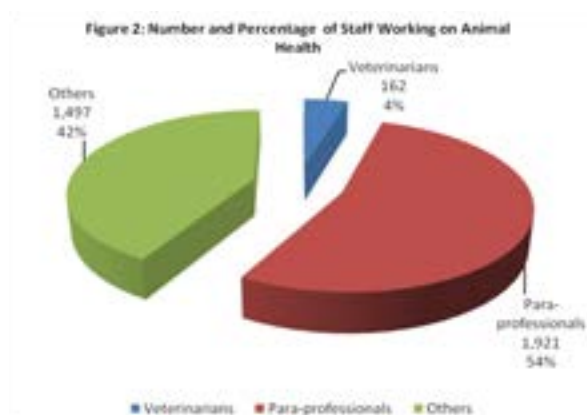
Animal healthcare infrastructure is poor. Disease diagnosis and surveillance, and control and immunization against endemic diseases are key elements of preventive animal healthcare. The Tanzania Veterinary Laboratory Agency (TVLA) supports these activities. It manages eight zonal TVLA centres that are responsible for laboratory work and diagnostics, while the department of veterinary services (under MLF) manages eight zonal veterinary centres (ZVCs) responsible for disease surveillance, control and advisory services. Vaccine production is done at the TVLA in Dar es Salaam.

The veterinary laboratory system for disease diagnosis is new. The TVLA was established in 2012. Its main objectives are to (1) strengthen investigation of animal diseases; (2) provide laboratory services in the country; (3) ensure efficient technical support for disease surveillance, diagnosis and quality control and (4) supervise field vaccination campaigns. The TVLA comprises the central veterinary laboratories in Temeke, Tsetse and Trypanosomiasis Research Institute (TTRI) in Tanga, Tsetse and Trypanosomiasis Research and Control Centre (TTRCC) in Kigoma and the zonal veterinary investigation centres (seven zones) in Arusha, Iringa, Mpwapwa, Mtwara, Mwanza, Tabora and Temeke.

The main actors in the animal health structure include the government, private veterinarians and animal health officers. Public veterinary officers are administered under the central government and local government authorities (LGAs). They are responsible for responding to various disease outbreaks and ensuring safe and secure public health at national and district levels, respectively, while private veterinarians are responsible for providing clinical services in their specific locations. In addition, community animal health workers (CAHWs) provide animal health services in some villages. Swai and Masaza (2012) noted, in an evaluation of competence of CAHWs of the Manyara region, that the majority of CAHWs are competent in keeping proper drug records, providing correct disease diagnosis and correctly matching the drugs with diagnosis. However, there is inadequate information for other regions. In some parts of the country, traditional herbalists provide basic services due to limited availability and unaffordability of veterinary services. The control of TADs, diseases of economic importance and zoonotic diseases is the responsibility of the government², and the control of non-TADs is the responsibility of the private sector and other stakeholders. All actors in the animal health sector are regulated under the Veterinary Council of Tanzania (VCT). According to MLFD, the research and investigation of animal diseases is not a major activity, mostly because of lack of resources. As such, only an insignificant number of animal health providers engage in disease investigation and control.

There is a great deficit of animal healthcare providers.

Figure 7: Animal healthcare providers.



A report from VCT (2012) indicates that there are 3580 registered animal health staff in the country, and the majority work under the LGAs. Only 4% (162) of all animal health staff are veterinarians, while 54% (1921) are para-professionals, including stock assistants and technicians (see Figure 7). Based on the number of cattle in NSCA 2007/08, there is one animal health staff to attend to 5901 cattle. While para-professionals make up the largest share of animal healthcare providers, they are not officially sanctioned. Private veterinarians primarily work in the cities (Dar, Arusha and Mbeya) and a few in other districts. This indicates the need to recruit and train more animal healthcare providers. Greater efforts should be directed towards capacity building in order to have an adequate animal health delivery service in the country.

2 It is under the Ministry of Livestock and Fisheries Development.

Disease reporting needs simplification. The decline in animal disease reporting is exacerbated by the poor coordination and information flow between the local and central government structures. According to MLFD, the reporting format between the local and central government levels is currently not working. There are many steps between the reporting of suspected animal diseases to confirmation. For some diseases, a farmer reports to the field officer who then notifies the district-level veterinary officer, then the reporting proceeds to the zonal veterinary officer and finally to the department of veterinary services under the MLFD at the central level. Such lengthy formats can dissuade farmers from reporting suspected diseases. A more simplified reporting format linking the district level more directly to the central level could help simplify disease reporting. Lastly, coordination between the local and central level in terms of planning has to be improved.

Animal health service delivery system faces many difficulties. The government is the primary provider of veterinary services. However, current budgetary resources cover primarily salaries and benefits of full-time staff; only a small budget is allocated to veterinary drugs and other needed supplies.

Animal health service delivery is constrained by a number of issues, including a weak private sector, inadequate infrastructure, high cost of veterinary inputs, inadequate technical support services and low adoption of technologies (NLP 2006). However, the livestock sector development strategy (2011) outlined a number of strategic interventions that are being employed in order to strengthen veterinary public health and food safety (VPHFS) in the country. These include the following:

- a. Establish (a) mechanisms for public and private sectors to share the responsibility of controlling non-transboundary infectious diseases, (b) technical advisory committees to deal with outbreaks of diseases of major economic impact and public health concern, (c) mechanism for subsidizing activities for control of tick and tick-borne diseases and (d) a disease early-warning system and emergency preparedness unit to deal with epizootics of diseases that are of major economic and public health importance.
- b. Enhance the capacity of the veterinary laboratory system to conduct disease surveillance.
- c. Enable livestock research institutions to investigate the role of indigenous technical knowledge in ethno veterinary medicine, and ensure greater control of other ectoparasites.
- d. Avail vaccines for major epizootic diseases throughout the country in times of outbreaks.

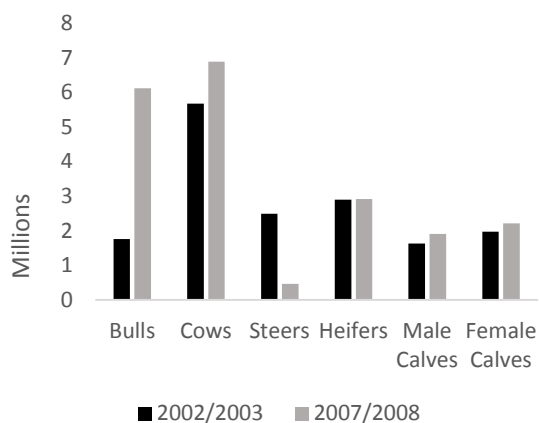
Key points

- Incidence of animal diseases is high and hinders animal productivity, causing economic losses at all levels.
- Government-priority animal diseases include CBPP, ECF, ASF, PPR and brucellosis.
- Preventive animal health services and infrastructure are poor and underfunded.
- There is one animal health staff to attend to 5901 cattle.
- There is a great deficit of animal healthcare providers primarily focused on vaccination, with few involved in disease investigation and control.
- The current diseases reporting system needs simplification, and improved coordination between local and central government structures is needed.
- Vaccination rates are low, especially for poor female-headed households.
- Animal disease delivery system faces many challenges, including limited financial and human resources.
- The government, with little engagement with the private sector, primarily provides animal disease healthcare.
- There is little investigation and data on the impact of endoparasites and overall economic burden of the major animal diseases.

Breeding and dairy genetics

Indigenous breeds dominate the Tanzanian cattle landscape.

Figure 8: Comparison of indigenous cattle herd composition.



According to the NSCA 2007/08, the national herd is composed of 20.5 million, 97.1% of which are indigenous cattle, 0.4% are improved beef and 2.4% are improved dairy. Most of the livestock are owned by smallholders in the traditional sector in rural areas, while a small percentage is owned by the commercial sector (large-scale farms). On the other hand, the TZNPS results in terms of total livestock ownership show rural households hold on average 2.72 TLUs, which are dominated by cattle (2.24 TLUs is equivalent to 82% of total rural livestock ownership; Katia *et al.* 2012). However, the composition of the national herd has varied over the years based on different factors, including genetic potential of the existing herd, poor husbandry practices and climate change.

Table 7: Comparison of indigenous cattle herd composition

Census year	Bulls	Cows	Steers	Heifers	Male calves	Female calves	Total
2002/03	1,763,664	5,678,324	2,489,379	2,897,359	1,626,448	1,969,397	16,424,571
2007/08	6,117,237	6,891,131	468,550	2,920,011	1,905,094	2,215,592	20,517,615
% Growth	71	18	(431)	1	15	11	20

Source: TNSB (2009)

The composition of the national herd is compared between two national censuses of agriculture conducted in 2002/03 and 2007/08. The data show a sharp growth rate of 71% for bulls (both castrated and uncastrated) and a huge decline in steers by 431%. There were further increases for cows (18%), heifers (1%), male calves (15%) and female calves (11%). It is unclear why there was a sharp drop in the number of steers in both years, but the long drought in 2008 that resulted in the death of thousands of animals, especially in the northern part of the country, possibly contributed to the distortion in the herd composition.

Crossbreeding has long been followed to improve breeds, but with mixed results. The practice of introducing exotic breeds and crossing them with local breeds dates back to early 1950s, but inadequate attention has been paid to selecting from within the best-performing local breeds. Table 8 shows the typical dairy cattle breeds found in Tanzania, their main purpose, breed type and the production system in which they are typically found.

Table 8: Dairy cattle breeds

Category	Breed group	Main purpose	Typical production system
Indigenous (Comprises 97% of the cattle population)	Tanzania Shorthorn Zebu (TSZ)	Produce 300-500 litres of milk per lactation	Pastoral production systems
	Ankole		Extensive pastoral production systems
	Singida white		Government stations
	Sahiwal		Government stations (may be mainly introduced from Kenya)
'Synthetic' breed developed	Mpwapwa: Original cross: 32% Red Sindhi, 30% Sahiwal, 19% TSZ, 11% Boran, 8% Bos taurus (Ayrshire)	Dual purpose—Meat and milk production (6-12 litres of milk per day)	Mainly research station—Mpwapwa research, Smallholder farmers near research station
Exotic crosses with indigenous (740,000 head)	Holstein-Friesian	Produce 2000-4000 litres of milk per lactation	Government-run livestock multiplication centres; smallholder systems
	Ayrshire		
	Jersey		
Purebred exotic breeds	Mainly Holstein Friesians		Large private sector farms (very few in the country)

Source: Ojango (2014)

There is a wide range of dairy crosses currently found in Tanzania with dairy cattle concentrated in the cool highlands of Kilimanjaro and Arusha, Southern Highlands in Mbeya and Iringa, Tanga and Karega areas. Overall, crossbred cattle produce more milk than indigenous ones. As such, there is a high and growing demand for improved dairy animals across all production systems.

Many livestock farmers practice controlled mating by either using the best males from within the herd, or avoiding mating of close relatives or corrective mating. On average, farmers use high-quality breeding males from neighbours and/or other suppliers, exchange and/or purchase high-quality males, and some purchase high-quality females and use AI. Selection within own herd and natural mating is commonly practiced in the traditional sector. Few dairy farmers have a breeding strategy in place. Most rely on inseminators to inform them about available bulls, the characteristics of those bulls and AI. In Sabilo (Manyaraa region), bulls are most commonly used for reproduction, and the cost varies between TZS 8000 and TZS 10,000 per conception. The performance of crossbred cattle varies due to animal diseases and lack of adaptation to local conditions.

Experiences from other countries show that crossbreeding coupled with natural selection and grading from within local breeds can improve animal genetics. For example, South Africa has developed fully stable high-performing breeds for their local environment through systematic selection and grading for over 40-50 years. Drawing on lessons on breeding strategies and policies is important as Tanzania aims to develop its dairy sector. An animal breeding policy act has been prepared, and it is in the cabinet for approval. It is expected to become an important instrument to guide the development of livestock genetics.

Crossbreeding through the use of AI is practiced, albeit at a low scale and under challenging AI delivery environment. In 1982, the government promoted the use of AI services by establishing NAIC in Arusha, with the aim of increasing the use of AI services to a larger part of the country. NAIC is currently facilitated through MLFD to produce semen and train inseminators.

The production level at NAIC has increased over the years with a total of 172,000 doses of semen and 39,150 litres of liquid nitrogen produced in 2011-12. The MLFD aims to strengthen and promote AI field services by establishing zonal AI centres. Currently there are four zonal AI centres, including lake zone (Mwanza), central (Dodoma), southern highlands zone (Mbeya) and eastern zone (Dar es Salaam). All four are equipped with LN2 plants and tanks (MLFD

2012). The overall objective is to bring the services closer to the users, reduce operational costs and attract more farmers to the service. The access and use of AI is commonly found at different levels on commercial farms, especially intensive dairy farming. However, AI services have not been used significantly to produce crossbred within the traditional herds.

Several factors have contributed to the low success and use of AI services. AI centres are stationary, limiting the service delivery to farmers. Inadequate quality and quantity of semen doses and poorly trained inseminators are reported as limiting factors. The support infrastructure to assure timely delivery and availability of high-quality semen at AI centres is inadequate. Key informants report that public-provided AI services are cheaper, but that the semen quality is poor compared to imported semen. The use of poor equipment is noted as a problem as well.

Furthermore, **the use of AI is constrained by insufficient budgetary support**, inadequate expertise and infrastructure, insufficient improved genetic resources, poor management, lack of livestock breeders associations and the necessary infrastructure for an extensive AI schemes and poorly performed AI field services. As alternative means, some producer groups are interested in having their own AI services by training a member in providing AI services or contracting other farmers to deliver AI services.

How does a calf come out of a straw? There is a need for capacity development and to educate farmers regarding the use of AI. The misperception regarding AI and how it works creates challenges for inseminators and farmers, and the use of AI services. The key actors in the Tanzanian dairy sector at a DDF annual meeting (2014) noted that there is a need to create greater awareness among farmers on AI technology itself. Inseminators sometimes risk being 'stoned' if conception does not occur. Key informants and industry stakeholders report a real need on the ground for capacity development and education at farm level. AI services have been used with some measure of success on parastatal ranches and heifer-breeding units (HBUs).

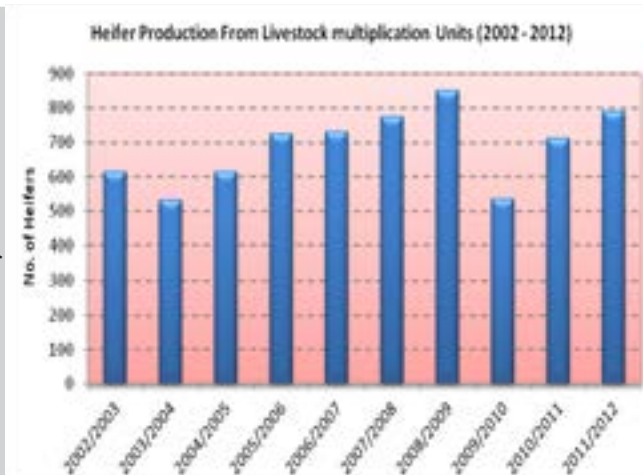
To increase the supply of FI dairy heifers, HBUs currently known as LMUs were established. The plan was to have one HBU in each region. HBUs were stocked with TSZ or Boran cows for crossbreeding with exotic sires, mainly Friesian, Ayrshire and Brown Swiss. By the late 1980s, 17 regions had established their HBUs through World Food Programme (WFP), UNDP/FAO and government funding. Out of these, 11 were under the MLFD. According to Massawe (1993), about 2000 heifers were produced from these units annually against an estimated national demand of 8000 heifers and a production target of 5000 heifers per year (MALD 1989).

The performance of HBUs had thus been rather low, and the earlier strategy was to privatize the farms, such that some farms would be handed over to the respective LGAs for subdivision into smaller farms (50 ha) to sublease prospective private Tanzanian investors. A total of 6870 heifers had been sold to farmers from these farms between 2002 and 2012 (MLFD 2012).

Box 2: Heifer Breeding Units (HBUs)

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Key points

- Crossbreeding has long been followed for breed improvement, but with mixed results.
- Crossbred cattle produce more milk than indigenous livestock; 3% of the national herd's crossbred cattle produce 30% of the milk.
- There is high demand for improved dairy cattle.
- A proper breeding policy and strategy is needed for selection and grading of improved breeds, which pay more attention to selecting from within the best-performing local breeds.
- The low success and use of AI services is constrained by the lack of the necessary infrastructure for an extensive AI scheme, poor support services to assure the timely delivery of semen at AI centres and lack of financial and human resources.
- Although cheaper, the quality of publicly provided semen is poor compared to imported semen.
- Most livestock farmers practice controlled mating by either using the best males from within the herd or using bull services in the communities.
- There is a need for capacity development and education of farmers regarding the use of AI technology and how AI works.
- There is a dearth of data and assessment of the performance of AI services in terms of conception rates and its cost.
- The role of the private sector, NGOs, farmers and community-level organization in the administration and provision of AI services needs to be examined.

Feed supply

The main feed resources in Tanzania can be grouped into natural grasslands, established pastures, cereals, root crops and agricultural by-products (Kitalyi and Kabatange 1999). Natural pastures are exclusively used in the traditional sector where herding is a common method of feed for the ruminant population. Pasture establishment is practiced by a few farmers particularly in the zero-grazing and/or semi-intensive systems, where cattle are confined, managed, fed, watered and milked. Data to quantify pastures utilized in the traditional sector and zero-grazing systems are not available. However, according to Komwihangilo *et al.* (2009), the traditional sector is constrained by inadequacies in quantities and qualities of pasture. In response to this inadequacy, pasture and pasture seeds (fodder and forage) are grown and sold by the government-managed seed-production farms and privately owned farms. In 2011-12, government farms established 1542 hectares, and a total of 376.4 hectares were established by private large-scale farms, producing 403,604 and 500,000 bales of hay, respectively (MLFD 2012).

The availability and quality of the feed resource fluctuates during the year between the wet and dry seasons, respectively. While in the wet season forage is abundant, it is both scanty and of poor quality in the dry season (Kitalyi and Kabatange 1984). Livestock keepers adopt various strategies to overcome feed-shortage problems during the dry season. Among them is the grazing in the crop fields after the harvest to utilize crop residues, but this practice brings conflicts between crop farmers and livestock keepers. Alternatively, cattle are moved to distant areas in search of water and green pastures.

There is high variability of feed by region. In Babati district of Manyara region, grazing contributes to the largest proportion of the feed based on dry matter (85%), metabolizable energy (84%) and crude protein (84%) throughout the year. There is no fodder cultivation, and few farmers buy maize gluten with bran as a feed resource.

In Lushoto (Tanga region), zero grazing is practiced, and farmers apply a cut-and-carry system of fodder. Natural green forage and collected feed are the primary component feed in the area and contribute to the largest proportion of feed. Some farmers prepare feed (e.g. by chopping) and a few supplement by using maize bran. There is a high abundance of feed in the area during the long rainy season.

In Morogoro, grazing of natural grassland is the main source of feed. There are plenty of natural grasses during the wet season. During the dry seasons farmers complement natural grazing with maize bran concentrates, and some farmers practice stall feeding (e.g. in Manyinga). During the dry season, farmers travel long distances to find feed. Also, crop residues (e.g. maize stover and rice straw) are collected from farms after harvest, stored and used for feeding during the dry season.

Based on a descriptive analysis of the LSMS-ISA Tanzania data, Covarrubias (2013) reported that 20% of households purchased fodder for their livestock. The share of purchasing livestock ranges from 13% for the poorest group of households to 37% for the top quintile of rural households involved in livestock keeping. Poor female-headed households report low level of purchasing fodder.

Poor animal nutrition, particularly in the dry season, is a key constraint in the traditional sector and compromises livestock productivity in the country. During the dry season, low milk production averages 1.4 litres per cow per day (Kitalyi and Kabatange 1999). In addition, the slow growth rates leading to the attainment of mature weights in seven years are partly due to poor nutrition. Furthermore, pasture growth in Tanzania is limited by sustained droughts and changing weather patterns that prompt movements especially in pastoral system.

As a result, the animal feed industry faces many challenges, including improving the quality of feedstuff, obtaining reliable supply of raw materials, improving knowledge on feed formulation, regulating animal feed industry, increasing investment in animal feed production and formulating and strengthening animal feed manufacturer associations.

Manufactured animal feed products

Compounded feedstuff composed of protein, energy, mineral and vitamin concentrates are important especially for dairy, poultry and pig production. Optimum productivity of animals largely depends upon the adequacy of all essential nutrients in rations. These feedstuffs are manufactured by private companies and sold on retail and wholesale to livestock farmers mostly in urban and peri-urban areas. The production of compounded feedstuff is estimated at 850,000t per annum, while the potential demand stands at 2.5 million t (MLFD 2012). From the available time series data, the production of commercial feeds has been increasing between 2001 and 2008.

Pastures and seeds are established mainly on government farms/stations, followed by private farmers and individuals. According to the MLFD report (2012), about 95t of legumes, grass and fodder seeds were sold by government-owned farms and private farms. The optimum productivity of animals largely depends on the adequacy of all essential nutrients in rations. This requires producing high-quality feeds to satisfy the demand of livestock farmers in achieving their production goals.

The private sector is now playing an important role in compound feeds. The feed industry comprises 30-70 large-feed compounders and more than 100 small compounders. The primary output is compound poultry feed. Key informants note that the industry desires to produce and sell more dairy feeds, **but that many dairy farmers do not trust the declared composition of these compounds.** Raw material and compound testing is extremely limited due to the lack of easily accessible laboratories, inadequate capacity and lack of resources at the existing laboratories. Currently, no Tanzanian feed company has an in-house lab.

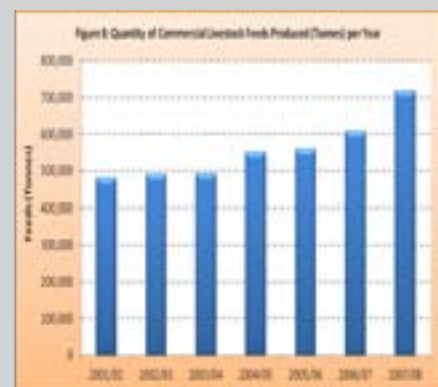
Since there is increasing demand for feed, there is great potential for an industry feed certification scheme to assure and improve the quality and consistency of concentrate dairy feed. Such a scheme can improve trust in the industry and increase the use of manufactured dairy feed among farmers. The establishment of such a scheme needs resources and engagement of various partners, including the government, farmers and other dairy value chain actors. Commodity price volatility and supply constraints remain key limiting factors for feed manufacturers and producers.

Box 3: Feed manufacturing in Tanzania

The animal feeds industry in Tanzania dates back to 1965 when the Unga feeds company of Kenya installed a small feed mill in Dar es Salaam specifically to supply feeds to Dar es Salaam and Kilimanjaro regions.

The Unga Group Limited was nationalized and became the National Milling Corporation Ltd in 1967.

The Tanzania Animal Feed Company (TAFCO) as a parastatal was formed in 1982. The company faced several problems, including worn-out machinery, lack of funds to replace machines, high operational costs and poor management, which resulted in the company being declared insolvent and placed under receivership in 1989. Due to policy reforms and liberalization of trade, several private feed mills, such as Interchick, Rajan and Azam, were established. Although they were relatively small, they offered competitive services to buyers and filled the gap created by liquidation of TAFCO.



Feedstuffs account for about 60% of production costs of farm animals (Njombe and Msanda 2010).

Demand for processing technology options—such as simple chopping, baling and making blocks with urea molasses and ingredients to improve quality—should be pursued. The production of compounded feedstuff in the country is constrained by the low quality of feedstuff, seasonal availability of raw material, inadequate credit facilities, insufficient supply of raw materials, limited knowledge on feed formulation, high cost of production and weak stakeholder associations. Another constraint is that there is not enough supply of cereals and root crops produced for both human and animal consumption.

Land tenure—a policy in transition

The land tenure policy in Tanzania can best be described as a policy in transition. Privatization of land is commonly found in urban and peri-urban areas and also in densely populated rural areas. But in the extensive production areas where the majority of livestock is reared, land is still under a common access setup. For the majority of smallholders, livestock are highly valued for their non-market roles, including provision of food, livestock as an asset, savings and for risk management. In spite of livestock playing a critical role in the livelihoods of poor people, the efficient utilization of feed is low because a significant proportion is used primarily for maintaining the stock. As a result, there is more incentive for each individual livestock keeper to exploit the land to the limit, and little incentive to conserve and improve the productivity of land by increasing offtake and reducing flock/herd size. The issue of land and land tenure remains a challenge, not only in terms of feed availability but also a source of various conflicts related to the sharing of natural resources, especially among pastoralists and crop farmers. Capacity development on minimizing land degradation and maximizing the efficient use of natural resources through better rangeland practices is needed.

Key points

- Feed scarcity, both in terms of quantity and quality, is a key constraint to improving dairy productivity.
- Poor animal nutrition, particularly in the dry season, is a key constraint in the traditional sector.
- Poor female-headed households report low levels of purchasing fodder.
- The private sector is now beginning to play an important role in the manufacturing of compound feed.
- Given the high demand for feed, especially in the dry season, there is a need to establish a certification scheme to promote trust and better coordination in the feed industry.
- Land policy is in transition. In the extensive pastoral and crop-livestock systems where dependence on communal land is high, the role of improved feed technology and markets is limited.
- Better rangeland management is important, given many livestock keepers' dependence on these systems for their livelihoods.

Knowledge systems

Livestock research is conducted under the Tanzania Livestock Research Institute (TALIRI). The main focus of TALIRI is to strengthen animal production research, while the TVLA is concerned with research on animal diseases. Furthermore, higher learning institutions, including Sokoine University of Agriculture, the Open University of Tanzania and University of Dar es Salaam, carry out livestock research in the country. Other main research collaborators are the Tropical Pesticide Research Institute, Tanzania Wildlife Research Institute, Tanzania Forest Research Institute and the Commission for Science and Technology.

The directorate of livestock research training and extension services coordinates livestock research. The livestock research coordination unit coordinates research programs on dairy cattle, beef cattle, small ruminants and non-ruminant animals, animal feed resources, farm animal genetic resources and animal diseases.

Funds for livestock research come from the Agricultural Sector Development Programme through the MLFD. To enable research centres' plan and implement research programs relevant to the respective zones, the zonal offices under zonal steering committees through the Zonal Agricultural Research and Development Fund (ZARDEF) manage the research funding. These committees include regional and district officials, researchers, extension officers and farmers; they participate in workshops and conferences where researchers and other stakeholders within the regions deliberate on research activities, including setting zonal research agendas and priorities.

Extension services

Public extension services play a major role in knowledge and technology transfer. Extension activities related to livestock are administered by the MLFD. According to the national livestock report (2009), 90% of households obtain extension services mainly from the government. Other sources include neighbours, NGOs, radio and television. Disease control dominates the type of advice that farmers obtain, followed by advice on housing and proper feeding of livestock. There is no structured information system where dairy farmers and other stakeholders can access information on animal husbandry and production, prices and other market-related information. The Tanzania panel data on livestock and livelihoods reveal that 25% of households in rural areas access extension services predominantly on production practices and animal disease, and it positively depends on the size of livestock ownership.

There is a dearth of information on the quality of extension services that livestock farmers receive. Most of the data tend to investigate the number of visits of extension agents and availability or non-availability of services, but rarely on usefulness or quality of services. In addition, there is not much data on extension agents' constraints and training needs.

Limited funding further constrains access to information and extension services. Challenges to effective dissemination of information in the country include inadequately trained and qualified researchers, and inadequate funding and research facilities. Limited funding weakens cooperation and collaboration among researchers, and coordination of research at the national level and provision of extension services. The government made a commitment to allocate 1% of GDP to agricultural research activities and to improve salary schemes of researchers and the placement of livestock research coordination unit in the MLFD's organizational structure. However, this commitment is yet to be fulfilled.

Access to credit

Access to credit and financial services is inadequate in rural areas. Based on the Tanzania panel data survey (with a total of 3265 households of which 1499 are livestock producers), only 6% of livestock-keeping rural households reported receiving credit, and 5% reported membership of a savings or credit group (Covarrubias *et al.* 2012). Furthermore, Covarrubias *et al.* (2012) noted that for those who had been granted credit, the value of loans received varied little according to land size. At the same time, **participation in credit or savings groups was low.** Many dairy farmers refrain from taking loans because of various problems associated with the presentation of collateral to secure loans. Currently, the government is making efforts to establish an agricultural bank to provide affordable interest to farmers.

Most livestock producers receive financial services from savings and credit cooperatives (SACCOs) and dairy farmer groups. A report by Mpangalile *et al.* (2010) on innovative finance outputs and marketing revealed sources of investment to include non-banking financial institutions, individuals, own funds raised from various sources, loans from banks, SACCOS and member contributions within groups. Two banks, namely, National Microfinance Bank and CRDB Bank Plc, provide loans to traders, cooperatives and groups in the sector. In addition, various microfinance institutions, such as FINCA and PRIDE, exist in the rural areas with small-sized loans targeting the humanitarian consumption needs of rural households.

Key points

- Public provision of extension services plays a major role in the delivery of extension services to farmers.
- Most advice and service delivery is on animal diseases and animal husbandry management.
- Access to extension services is not scarce compared to credit, but limited funding is a constraint to increasing its coverage.

- Many farmers vaccinating their animals have access to extension services, and households with larger herds use extension services the most.
- There is little information on the quality of extension services and not much on the needs of extension officers.
- Access to credit remains elusive for many rural livestock producers, and there is little information on livestock insurance for livestock.

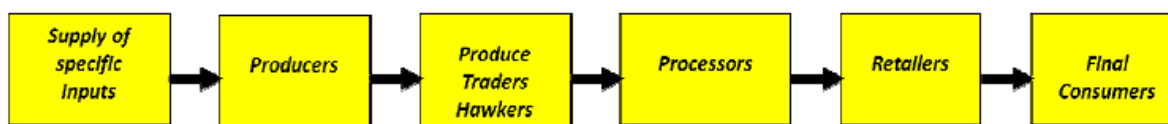


Value chain, value addition and marketing

General description

Tanzania's dairy value chain is composed of different nodes, each with a slightly different degree of coordination and mode of transaction. Figure 9 provides a generic depiction of these nodes. The key actors in the dairy value chain include input suppliers, input traders, hawkers, small-scale and commercial producers, small and large processors, distributors and wholesalers, retailers and final consumers.

Figure 9: Generic value chain linkages.

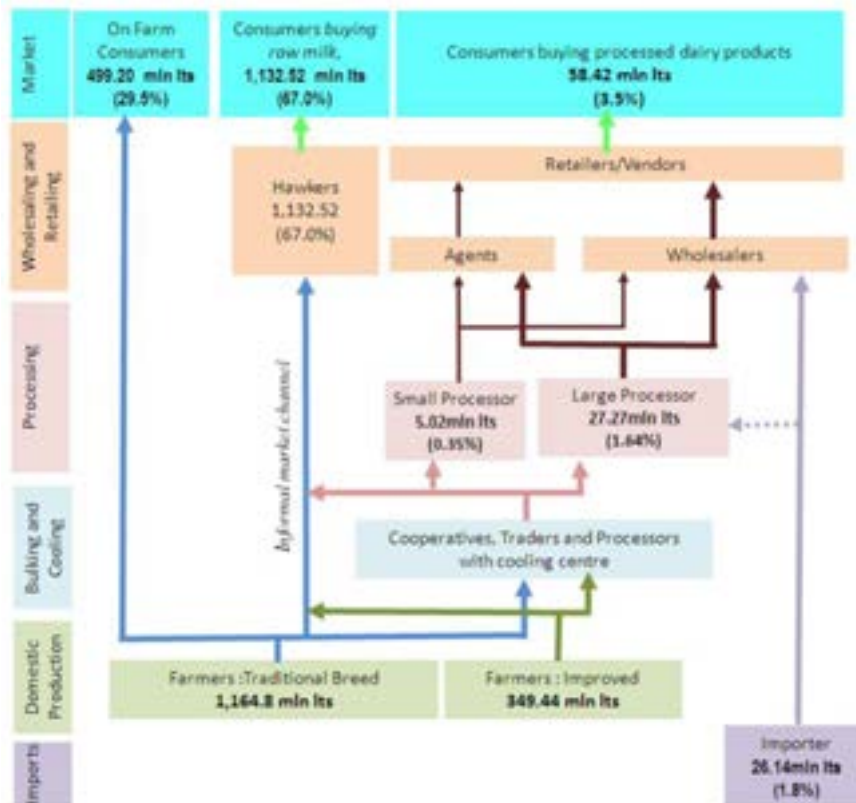


Source: Dillmann and Ijumba (2011)

A more detailed description of the value chain is shown in Figure 10. It divides the consumer market into home consumption with a market share of 29.5%, consumption of raw milk at 67% and consumers buying processed milk account for only 3.5% market share. **Almost half the milk consumed in processed form is imported.** According to the Tanzania Dairy Board (2013)³, for every packet of locally processed milk in Tanzania's supermarkets, there is one packet of imported milk.

³ Mutagwaba, Charles. 2013. Overview of Tanzanian dairy industry. *CLEANED Project East Africa Stakeholder Consultation on Dairy and Environment held in Nairobi, Kenya, 18 September 2013.*

Figure 10: Dairy sector in Tanzania 2010.



Source: NIRAS (2010)

Pricing in the value chain

Prices paid to producers depend on the season and vary by region. Based on data collected in 2011, TechnoServe (2012) noted that the farm gate price per litre of milk paid by a trader is between TZS 600 and TZS 800. Furthermore, when a producer sells directly to a milk kiosk or retailer, prices range between TZS 500 and TZS 700 per litre. A higher degree of customer loyalty is observed between milk sellers and kiosks. When a farmer sells directly to a consumer, prices range from TZS 400 to TZS 1000.

Milk collection centres determine prices with little negotiation with farmers. Milk sold to collection centres fetches TZS 550 to TZS 700 (TechnoServe 2012). Processors set the price when selling to retailers. Sometimes there is an agreed-upon price before the transaction. Between traders to retailers, the price of milk is about TZS 800, and traders generally set the price; immediate payment is usually required in this case. From a milk collection centre to a retailer, the collection centre sets the price.

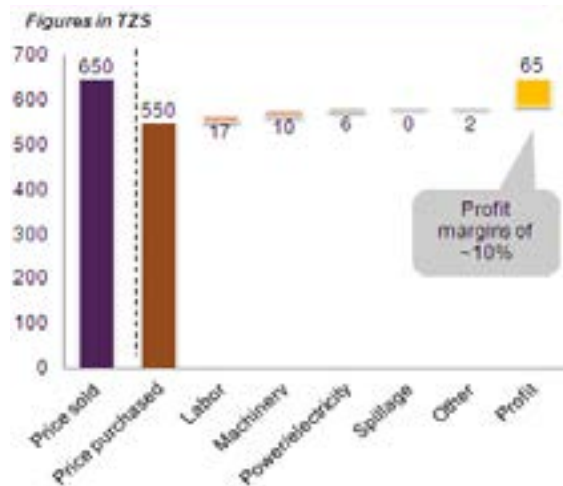
According to Mchau *et al.* (2009), due to inefficiencies and high transaction costs in the existing formal value chain for fresh milk, the producers' share of the consumer price ranges between 25-32% in Tanzania, while it is as high as 80% in Anand, India.

The dairy value chain is characterized by low vertical coordination and little formalization. Transactions mainly take the form of informal verbal agreements and simple contracts. Some processors use simple contracts with farmers, but processors note that these hardly work. Sales diversion occurs, especially during the dry season. In dealing with low milk supply during the dry season, some processors require farmers to commit to supplying milk during the dry season as a condition to securing a contract with the processor. But processors still lose milk, sometimes up to 40% (in the case of Tanga Fresh) because farmers have little supply. But a few large farmers meet

contract requirements during the dry season. While in reality there is interdependence among milk producers, traders and processors, the current relations and transactions are short term, characterized by low vertical coordination.

Milk collection centres

Figure 11: Chilling plant cost structure per litre, 2012.



To operate profitably and minimize hold-up problems, most processors own milk collection centres. For example, Tanga Fresh has 36 collection centres in Tanga, 4 of which have cooling facilities. Milk collection centres are typically located in high farmer density areas with access to a large amount of milk supply. Tanga Fresh opened two collection centres in Morogoro, where milk supply is abundant, and had been able to collect as much as 11,000 litres per day (TechnoServe 2012).

Key informants note that 90% of suppliers providing milk to processors at the collection centres are smallholder producers (farmers supplying less than 100 litres per day). Powdered milk is not used much by processors; when used, it is to make yogurt. Because of taxes, processors find it expensive to import powdered milk. Farmers are not paid upon delivery at the collection centre. Tanga Fresh, for example, makes a payment to the collection centre every 15 days, and the collection centres, in turn, pay the suppliers 1 to 2 days after. Thus, payment delays discourage producers from supplying milk to collection centres. In other cases, collection centres advance money to farmers. However, some collection centres have had to reject milk especially during the wet season when the market is flooded.

Power outage is a common problem for milk collection centres. TechnoServe (2012) interviewed 13 collection centres and found that on average, profit margins for these 13 centres are approximately 10%. The largest cost drivers include labour, machine maintenance, input purchases and power-related costs. Some chilling plants run on subpar equipment that frequently breaks down. The 10% profit is generally not enough to invest back in the collection centre, including by purchasing. Access to credit and working capital was also identified as a constraint.

Processing

Average daily capacity utilization is about 25-30%. There are 50 to 62 processing units in Tanzania, with the large processing units located in major production regions of Mara, Tanga, Arusha and Iringa. Of the total milk processed in the country, Mara accounts for 40%; Tanga, 15%; and Arusha, 20% (Niras 2010). Forty-three processors are registered with a total capacity of 353,000 litres (varying between 500-120 litres per day). Table 9 and Figure 13 indicate the key processors and production levels. Tanga Fresh is the largest dairy processor with an output of 30,000 litres per day.

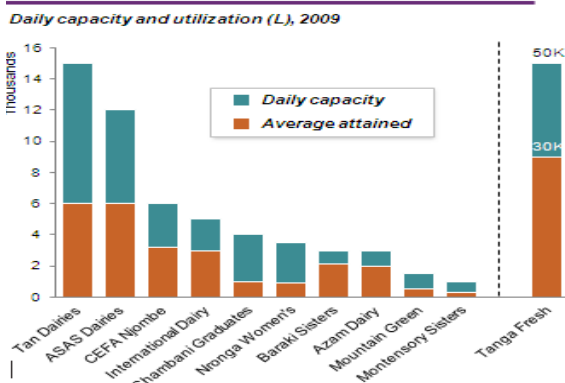
Table 9: Main processors' daily output

Processors	Daily output (litres)
Musoma Dairies	20,000
Mara Milk	6000
Tanga Fresh	30,000
International dairy products	4000
ASAS Dairies	10,000

Source: Nell et al. (2014)

Figure 12: Processor production and capacity.

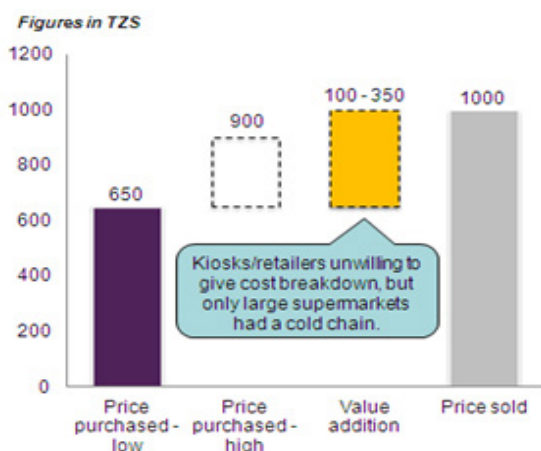
Processor Production and Capacity



Source: TechnoServe (2012)

The top two processors hold 50% market share. The remaining market is fairly fragmented. The main dairy products include fermented milk, pasteurized milk, ghee and butter, yoghurt and cheese (and mozzarella occasionally). Milk processed in ultra-high temperature (UHT) is only produced in the Mara region by two processors. The largest processor's (Tanga Fresh) main products include pasteurized milk (1/2 litre sachets) and fermented milk (1/4 sachets⁴). Overall, there is a shortage of value-added products, and this is covered by imports. Most processors sell dairy products locally. The large processors sell products in big urban areas like Dar es Salaam, where Tanga Fresh sells 80% of its volume.

Figure 13: Value for one litre of fresh processed milk, 2009.



Source: TechnoServe field research (2012)

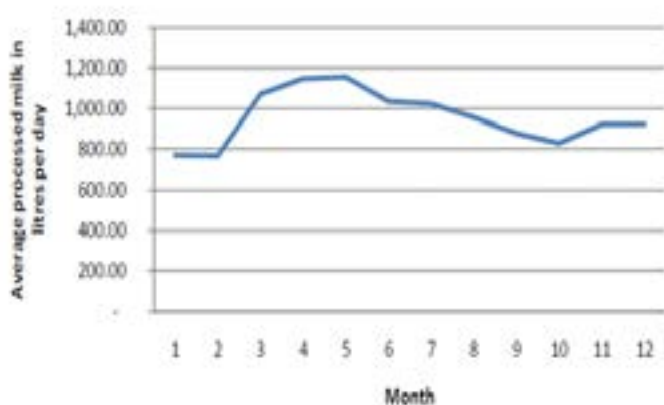
4 Nell (2014): Sachets will in the future not be permitted for environmental reasons and may be changed to plastic bottle of Tetra Pak.

Seasonality affects processors' profit margins. Capacity utilization is low primarily due inadequate milk production and to high supply fluctuations. For example, Tanga Fresh processes at above capacity in the high season, but as low as 25% in the low season. This affects profitability resulting in profit margins around 13% (TechnoServe 2012).

Processed milk tends to have lower margins than fresh milk due to specific mandates from large processors. For example, some Tanga retailers noted that Tanga Fresh mandates that one pack of fresh milk, which costs about TZS 400 for the retailer, be sold for TZS 450. Large shops have difficulty selling milk in the rainy season, when the supply of milk is plentiful throughout the region. When selling to small shops, processors are paid immediately, but they are paid at a later date when supplying to hotels and big supermarkets.

Seasonality of milk supply is a big challenge and one of the major limitations for processors. The fluctuations in milk supply can be significant in any year. More milk is available during the rainy season, but supply declines by about 40% during the dry seasons. Figure 14 shows the seasonality of dairy processing over a typical year. The seasonality in milk supply increases hold-up problems and costs to processors.

Figure 14: Seasonality of dairy processing.



Source: Dillmann and Ijumba (2011)

Farmers frequently end up receiving lower prices when supplying milk to processors, leading them to supply more to the informal milk markets where they fetch better prices. As such, only 3% is sold formally following pasteurization and packaging. In spite of this, there has been an overall increase in the amount of milk being processed over the last few years.

Poor road infrastructure and power outages are big challenges. High transportation costs and related transaction costs negatively affect the ability of processors to collect milk from remote areas where most milk-producing farmers reside. Transportation is a challenging part of the value chain as collection from farmers requires significant travel, and fuel prices continue to rise. Also, collecting in the remote areas is difficult due to lack of electricity. Power outages result in high generator usage or milk spoilage. The use of generators as an alternative source of energy is too costly for many small-scale and medium processors.

In terms of pricing, processors find it difficult to charge higher prices due to (a) a highly competitive market, especially with cheap imports, and (b) the inability of consumers to purchase processed products due to affordability. Some processors look for UHT capabilities. Mara Milk currently processes UHT milk, but profits were reported to be negative for this product.

Retailing

Retailers are composed of large supermarkets/stores, milk kiosks and canteens. Consumers purchase processed dairy products from supermarkets and unprocessed products from kiosks and canteens. Retailers and kiosks typically add 15-50% value to milk prices depending on season and product (TechnoServe 2012). For example, for one litre of processed milk, a retailer purchasing it at TZS 650 to TZS 900 can sell it for TZS 1000.

Mtimet *et al.* (2013) reported key information regarding dairy retailing and consumers. Their study found the average price of fresh-boiled milk to be the cheapest at TZS 500, followed by packaged pasteurized milk at TZS 1000 and lastly by raw fresh milk sold at TZS 1080. Furthermore, rural consumers report paying lower average prices (TZS 1000 per litre) for fresh milk compared to urban consumers. Regarding retail outlets, 25% of the sampled consumers buy milk from small-scale vendors followed by roadside milk vendors (milk kiosks and individual milk vendors). For urban consumers, 22% reported buying from supermarkets and small-scale vendors (22%). Dairy retailers are mostly concerned about the lack of storage and preservation equipment (30%). Electricity supply and price competitiveness were found to be common complaints by dairy retailers.

The government removed value-added tax for milk-packaging materials and import duty for imported milk-processing equipment to protect and promote the domestic milk market. Furthermore, the government has imposed suspended duty to the imported milk. Whether the domestic processors take advantage of these temporary opportunities to improve their productivity and competitiveness remains to be seen.

The informal dairy market is an important chain handling over 90% of marketed milk output. Informal raw milk marketing is still the dominant form of milk in Tanzania. It involves direct sales of milk to other farmers, neighbours and sometimes traders. According to the Tanzania Dairy Board (2013), of the 70% of milk produced in the traditional dairy sector, 90% is consumed at home, and 10% is sold in the informal sector (8%) and formal market (2%). Furthermore, of the 30% of milk produced in the improved dairy herd, 30% is consumed at home, and 70% is sold in the informal market (60%) and in the formal market (10%). Processing in the informal market is minimal, involving primarily the boiling of milk and thus very minimal value addition.

Estimates by the National Bureau of Statistics (2008) showed that direct sales to consumers account for 86%, about 11% go to local markets and only about 3% was sold to consumers after industrial pasteurization and processing. Analysis by NIRAS (2010) indicated a similar figure of only 5% for processed milk sales (Figure 10).

Furthermore, according to Tanga Fresh, the informal market always has the highest price (although not reliable most of the time). The higher price offered in the informal sector is an important reason why farmers sell most of their milk in this market. There have been attempts through government policy to channel surplus milk to dairy plants for commercial processing, with a view to supplying urban markets with hygienic milk and milk products. Improvements in processing, quality assurance and efficiency are necessary to expand the formal market.

The regulatory environment is challenging. According to TAMPA (2011), the main source of deterioration in milk processing in Tanzania is that the regulatory environment is burdensome and increases the cost of doing business, contributing to a decline in competitiveness of the dairy sector in the country. It was found that the sector is regulated by more than 15 regulators enshrined in 25 acts and by more than 25 regulations.

These regulations may have stifled the potential for growth of the nascent private sector in Tanzania to pick up the role previously played by the parastatal Tanzania Dairies Ltd (TDL) in milk processing, following the liberalization of the Tanzanian economy in the 1980s and 1990s. Whereas the private sectors in neighbouring Kenya and Uganda were able to pick up that role and stem the decline in early and late 2000s, respectively, following the same process of liberalization, the decline has persisted in Tanzania.

Key points

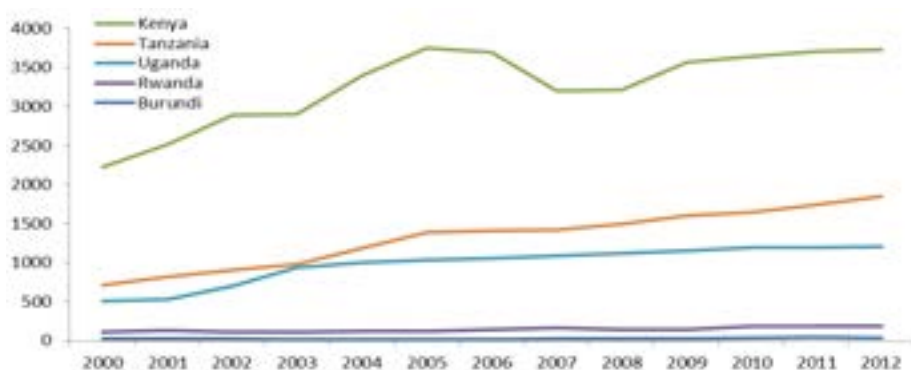
- The dairy value is characterized by low vertical coordination, including informal verbal agreements and simple contracts to minimize hold-up problems.
- Most processors operate far below capacity, averaging 30% of capacity utilization.
- Large processors are vertically backwards integrated, owning most milk collection centres.
- The two largest processors hold 50% of the market share of domestically processed dairy products.
- Power outage is a common challenge for many processors and retailers.
- The informal dairy market is a dominant chain handling over 90% of marketed milk, and it often offers the highest price to farmers.
- Almost half the milk consumed in processed form is imported.
- For every packet of locally processed milk in Tanzania's supermarkets, there is one packet of imported milk.
- The largest share of milk produced in Tanzania is consumed at the farm level or sold to neighbours.

Imports and exports

Tanzania is a net importer of dairy products despite its large cattle population and processing industries with sufficient capacities. Milk trade represents a small share of total milk production, but it is significant in off-farm milk consumption and in inputs in processing. According to MAFAP (2013), only 3.5% of domestic milk production is marketed, and nearly one-third of processed milk consumption is covered by imports.

Tanzania's dairy production and exports are far less than Kenya's. Figure 15 shows the difference in milk production of the countries that are part of the East African community. Kenya leads by far with over 3733 million litres of whole fresh cow milk in 2012, followed by Tanzania with 1853 million litres. Kenya accounts for 53% of the regional milk production and Tanzania for 26% followed by Uganda with 17%.

Figure 15: Whole fresh milk production in the EAC region, millions of litres, 2000-12.



Source: FAOSTAT (2014)

There are no tariff barriers within the EAC, but non-tariff barriers remain. Overall, the value of traded dairy products is over USD 14 million in 2013 (Comtrade 2011). Non-tariff barriers include administrative procedures, sanitary and phytosanitary measures and technical barriers to trade. Only a small amount of the milk produced goes through formal markets due to tropical temperature and poor cold chain infrastructure. Traded products are powdered milk and luxury products like cheese and yogurt.

Quality standards limit trade and are a major hurdle to overcome for Tanzania. Kenya is by far the strongest producer and exporter of dairy products of the EAC countries. Together, Uganda, Tanzania, Rwanda and Burundi only account for about 14% of exports. Quality standards limit trade and are considered a major hurdle to overcome for Tanzania, not just in terms of meeting the actual standards, but also in terms of the infrastructure necessary to monitor the implementation of the standards. Imports of dairy products have shown a modest decline in recent years, falling from 33,000t in 1980s to 25,000t in 2007. This constitutes about 2.5% of total domestically supplied dairy products in 2007 (see Table 10 below).

Table 10: Tanzanian imports of dairy products—milk, butter and cream ('000 t)

	1980	1990	2000	2007
Production	421	602	811	961
Import quantity	33	18	28	25
Domestic supply quantity	453	620	836	985
Import-domestic supply (%)	7.3	2.9	3.3	2.5

Source: Computed using data from FAO database

The proportion of imports in total domestic milk supply has been approximately 1-2% in recent years. But this does not reflect the significance of imports of processed dairy products. Shem (2004) proposed using dairy imports as a share of total marketed domestic production in targeted urban and niche markets. The analysis reveals that imports represent a significant share of the domestic marketed dairy supply and could have adverse effects on the growth of domestic production and processing industries. Using previous studies, Shem (2004) shows that imports constitute 27% of the total domestic milk that passes through formal/licensed markets. Furthermore, the role of imports becomes substantial when compared with the amount of milk processed locally. Furthermore, TDB⁵ (2013) notes that for every packet of locally processed milk in Tanzania's supermarkets, there is one packet of imported milk.

Table 11 shows trends with a breakdown of quantities and value of imported dairy products. Skimmed dry and whole condensed milk products constituted the bulk of Tanzania's imports up to mid 1980s. However, there is a noticeable shift in the pattern of imports during the past decade and a half towards whole dried milk, whose share in total imports value was 32.4% in 2010.

Table 11: Tanzanian trade in dairy products (1965-2010)

Quantity (t)	1965	1975	1985	1995	2005	2010
Skimmed condensed	0	171	0	0	0	0
Skimmed dry	1527	5171	3636	117	514	428
Skimmed of cows	0	0	0	85	535	855
Whole condensed	5873	3306	230	597	259	360
Whole dried	0	325	0	1136	868	1375
Whole evaporated	0	0	0	92	149	121
Value (USD 1000)						
Skimmed condensed	0	113	0	0	0	0
Skimmed dry	1030	5332	4839	226	221	349
Skimmed of cows	0	0	0	94	120	364
Whole condensed	1861	2219	210	401	62	273
Whole dried	0	468	0	1998	422	497
Whole evaporated	0	0	0	40	151	49

Source: Computed using data from FAO database

5 Mutagwaba, Charles. 2013. Overview of Tanzanian dairy industry. *CLEANED Project East Africa Stakeholder Consultation on Dairy and Environment held in Nairobi, Kenya, 18 September 2013.*

Based on 2003 trade data, Shem (2004) reported that dairy products are imported from 27 countries, with South Africa leading (22%), followed by Kenya (21%), then the EU (20%) with the Netherlands accounting for 14% alone and Zimbabwe (8%). The volume of imports increased between 2002 and 2003, reflecting the reduction of the suspended duty by 5% in 2003. This has partially contributed to the stagnation and slump in domestic production and processing industries.

There are inconsistencies in the trade data, especially for value of trade for dairy products in Tanzania, and it is difficult to obtain a producer price from secondary data sources. However, MAFAP (2013) estimates that milk-processing costs in Tanzania are 67% higher than those in the neighbouring countries, such as Kenya (RLDC 2010). Due to high costs and underutilization, processors can only pay about 40% of the reported farm gate prices to farmers. This serves as a disincentive for producers to sell milk to processors. At the same time, milk traders are protected by the external tariff, and as a result, consumers pay higher prices for milk in Tanzania than in international markets (MAFAP 2013).

Currently, Tanzania exports less than 1% of the total marketed production in the EAC. Kenya, the leading exporter among the EAC countries, exports less than 10% of total production. According to United Nations Comtrade (2009), Kenya exported dairy products with a value of around USD 26.5 million, followed by Uganda with USD 5.5 million and Tanzania with just under USD 1.7 million in the period 1997 to 2008. Dry powdered milk and long-life liquid milk are the main products that are exported to Tanzania. They are less perishable and easier to transport than fresh milk and other dairy products such as yogurt. In 2004, Brookside in Kenya bought a processing plant near Arusha. However, after finding that milk production in Arusha was insufficient to process profitably, Brookside decided to export the fresh milk to Kenya for processing leading to a trade dispute between the two countries in 2008.

Tanzanian products are currently not competitive against world standards, and as a result, negligible dairy products are exported. According to the Department of Agriculture of South Africa, '[Tanzanian] animal and dairy products do not qualify for export for health and quality reasons'. The Ministry of Livestock and Fisheries of Tanzania agrees and notes that 'domestic dairy products cannot compete in external markets ... partly because they are not rendered long-lasting before they perish'. Export companies typically have much larger scale than Tanzania processors, allowing them to sell milk at competitive prices. Many of the Tanzanian processors interviewed by TechnoServe did not understand how other nation's milk could be priced so low.

Regulatory environment

The Tanzania dairy board (launched in 2005) has the mandate to regulate the dairy industry, coordinate and promote the development of the dairy industry by the Dairy Industry Act (2004). Since its inception it led to various reforms of the dairy subsector, including the development of standards and quality-control systems, and the formation of national stakeholder associations, including the Tanzania Milk Producers Association and the Tanzania Milk Processors Association. It aims to increase participation of stakeholders in policy formulations, promotes the dairy industry through various events, including training and certification of farmers and traders, organizing National Milk Week celebrations and facilitating DDF meetings. Through the DDF, the dairy board engages various stakeholders, including farmers, private sector, service providers and government policymakers, to address issues affecting the dairy industry.

As mentioned before, TAMPA (2011) noted that the sector is regulated by more than 15 regulators enshrined in 25 acts and by more than 25 regulations. As such, many stakeholders and key informants point out that the regulatory environment is burdensome and increases costs of doing business.

Key points

- Tanzania is a net importer of dairy products and is not self-sufficient in this sector.

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- Kenya accounts for 53% of regional milk production, Tanzania for 26% and Uganda for 17%.
 - Most tariff barriers have been removed within the EAC, but non-tariff barriers remain.
 - Estimates show that milk-processing costs in Tanzania are 67% higher than those in the neighbouring countries.
 - Tanzania's dairy products are currently not competitive.
 - The regulatory environment is challenging and burdensome.



Food safety

Lack of quality-assurance systems is a key food-safety concern. Milk-safety problems in the country include adulteration (water and other substances), prevalence of the antimicrobial residues, drugs and heavy metals in milk and zoonotic diseases, such as tuberculosis and brucellosis. In spite of these problems, there is a lack of quality-assurance systems among the informal operators and among small- and medium-scale enterprises involved in value addition of animal-sourced foods.

Various authors (including Mahundi 2011; Kilando 2011 and Joseph *et al.* 2002) noted that adulteration of milk with water of dubious quality is an issue of public health concern. Water-borne and environmental pathogens of the enterobacteria types, such as *Campylobacter*, *Staphylococcus aureus*, Haemorrhagic *E. coli* O157:H7, are of concern in dairy and livestock products in the Tanzania. Furthermore, drug residues in milk and meat are another area of public health concern (Kurwijila *et al.* 2006). In view of the evidence from prevalence studies and the lack of regular surveillance and inspection measures, tuberculosis (Maiseli *et al.* 1989; Kazwala *et al.* 1998; Kazwala *et al.* 2000) and brucellosis (Mahlau and Hammond 1962; Msanga *et al.* 1986; Swai 1997) are of serious public health significance.

Much more remains to be done to have a functioning traceability system. The traceability system from farm to fork is not in place, although the MLFD is responsible for enforcing such a system. Livestock identification, an essential part of any traceability system, is also not in place. Traditional cattle, sheep, goats and pigs have no formal identification system. Only 155,000 ear tags were bought in 2008-09 for the use of animal identification at NARCO ranch. Overall, more emphasis is placed on inspection of food destined for export markets or being imported than for food manufactured for local consumption. None of the agencies use formal risk assessment methods, including quantitative and qualitative codex alimentarius, and quantitative and qualitative OIE.

Tanzania has experienced the following food safety scares in the last 10 years (ILRI 2011):

- a. Rift Valley fever (RVF) occurred in 2007. The outbreak was widespread in the rift valley regions of Arusha and Manyara, as well as Dodoma. It was widely publicized in the media, especially after more than 1000 people were reported to have died of either handling and/or consuming contaminated meat. A lot of people stopped eating meat, especially in the unregulated informal outlets, such as bars and street foods. Farmers, traders and meat shop owners incurred high economic losses. The government then resorted to frantic vaccination of animals in the affected areas. As a result, more than two million cattle in the affected areas were vaccinated.
- b. Anthrax caused by *B. anthracis* occurs sporadically in various parts of the country. Public awareness about the disease is widespread, and people are told not to eat meat taken from the cadaver of dead animals found with symptoms of the disease.
- c. Brucellosis caused by *B. abortus* may be transmitted to humans through consumption of contaminated milk. Although prevalence rates of 10-15% in traditional herds have been reported, people generally boil milk before consumption. Potential infections may occur through consumption of fermented milk prepared from

unboiled milk, a common practice among pastoral communities. Data on clinical cases of undulant fever caused by *B. arbotus* are rare and hard to come by.

The safety and quality of milk and milk products is regulated by the Dairy Industry Act No. 8 2004. The Tanzania Food, Drugs and Cosmetics Authority (TFDA) licenses the inspection of dairy facilities, such as dairy farms, plants, kiosks, milk parlours and other similar facilities. The Tanzania Bureau of Standards (TBS) is the statutory national standards body for the country; it was mandated to formulate, promulgate and implement national standards. Through its Agriculture and Food Divisional Standards Committee, the TBS sets standards of milk and milk products in the country.

To ensure product compliance with food-safety standards, the TBS has microbiological and food chemistry laboratories capable of conducting tests for spoilage and pathogenic microorganisms in foods, including *Salmonella spp*, *Vibrio spp*, *Listeria spp*, whereas the food chemistry lab is capable of conducting composition and physical analysis. All these laboratories are accredited by ISO 17025.

Key points

- Milk-safety problems in the country include adulteration (water and other substances).
- The lack of a quality-assurance scheme is a key concern among informal operators and small- and medium-scale enterprises.
- Food-safety scares in the last 10 years included brucellosis, anthrax and Rift Valley fever.



SWOT analysis

Table 12 summarizes observed strengths, weaknesses, opportunities and threats within the dairy value chain in Tanzania based on the discussion and information in this report.

Table 12: SWOT analysis of dairy value chain in Tanzania

Strengths	<ul style="list-style-type: none"> Large cattle herd with potential to improve output Strong experience and culture in livestock and milk production High concentration of the national herd in the smallholder system Growing demand for dairy products Smallholder dairy producers want to be linked to markets
Weaknesses	<ul style="list-style-type: none"> Significantly low productivity Huge fluctuations in production (especially from traditional herds), as milk production is mainly rain fed. Poor and inadequate infrastructure, breeding services and animal health support Low milk production makes milk collection uneconomical. Lack of private sector support for infrastructure development There is high animal disease incidence, and access to veterinary services is limited. Limited access to inputs, including credit, hinders producers' investment in improving dairy production. Use of AI is low, and there is lack of clarity on breeding strategy; farmers need capacity development and training in breeding to improve their dairy cattle. Feed scarcity (both in quality and quantity) is a key constraint to improving yield. Milk collection remains unorganized. Food safety and quality of dairy of products are not adequately addressed.
Opportunities	<ul style="list-style-type: none"> Growing demand in livestock and dairy products, especially in urban areas High demand for feed creates opportunities for fodder and feed production. Role for large dairy traders to innovate and link farmers to collection centres and markets Large proportion of cattle herd in smallholders, creating opportunities to reduce rural poverty given strong market linkages Rising interregional trade and demand for livestock products in the region
Threats	<ul style="list-style-type: none"> Lack of policy and public-private sector investment in key areas of feed, breeds and genetics, market infrastructure improvement High food prices and sluggish growth in per capita income Continued fragmentation of producers in marketing milk Milk and dairy products consumption is growing, but at a slow pace. Imports of competitively priced high-quality dairy products Negative environmental impacts of livestock production not being addressed sufficiently

Recommendations

To improve Tanzania's dairy sector's potential to contribute to poverty reduction and livelihoods, a two-pronged approach addressing both productivity improvements and reducing marketing and transactions costs in the dairy value chain is needed. There is more room for growth in consumption of milk and dairy products, and more needs to be done to stimulate per capita consumption. Table 13 provides broad recommendations based on the information discussed in this report. Detailed studies and analysis based on specific data on each of the issues are required to make specific recommendation on interventions. This report does not recommend specific interventions, but serves as a guide on key areas that are important in improving the performance of the dairy value chain in Tanzania.

Table 13: Broad recommendations

Challenges	Recommendations	Risks
Productivity	Increase milk production in traditional smallholder system from 5-6 litres per cow to 12 litres per cow.	Underinvestment in key areas affecting productivity.
1. Feed	Support and improve efficient use of available feed resources.	Feed price volatility and costs of manufacturing.
Inadequate feed supply (quality and quantity), especially the during season.	Increase investment by public and private sector in developing the feed industry. Develop standards and quality assurance for feed manufacturing. Invest and implement low-cost feed technologies (e.g. hay making, utilization of crop residue) and fodder production. Increase domestic production of feed ingredients.	Lack of uptake of low-cost technologies at farm level. Failure to accurately capture feed scarcity and demand in different production systems.
2. Breeding	Increase coverage and efficiency of AI service delivery.	
Low efficiency in AI delivery and use	Explore alternative supplies of AI and create a competitive environment among alternative providers. Train farmers on AI services.	
Lack of clarity on appropriate breeding strategy and policy	Explore local/community-based AI providers through associations.	
Public breeding approach has focused too much on exotic blood and artificial insemination.	Develop a national breeding policy to upgrade performance of indigenous breeds.	

3. Animal health	Simplify disease reporting to give incentive of disease reporting at farm level.	
Inadequate investment and resources given to preventive animal healthcare.	Improve coordination and planning between local and central government levels.	
Inefficiencies in disease reporting and response.	Improve feedback on reported suspected diseases.	
	Train and increase animal healthcare providers (coverage in rural areas).	
	Increase and invest in preventive animal healthcare (increase vaccination rates).	
	Increase resources to investigate animal diseases, including under investigated productivity-reducing problems (endoparasites).	
	Improve animal health delivery system.	
	Invest in electronic devices to improve delivery of disease management information.	
	Increase access to extension services.	
4. Access to credit	Increase access to credit and finance in rural areas.	
Limited access to credit and insurance to rural smallholder farmers	Promote micro-credit finance in rural areas, recognizing different needs of smallholder farmers.	
	Strengthen efforts to get the private sector to increase microfinance in agriculture.	
Low consumption	Increase and strengthen milk-feeding programs (school, hospital facilities).	No real increase in per capita incomes and food-price inflation.
Promote the consumption of milk and dairy products.	Improve efficiency and transaction costs to reduce cost of milk and dairy products.	Stagnant consumer preferences for milk and dairy products.
	Promote nutritional value of milk and dairy products.	
Value chains, markets and institutions	Reduce costs to increase producer's share of consumer price in the formal marketing channel.	
Low coordination in the value chain.	Investigate the role of cooperatives (including appropriate forms) and farmers' groups in milk collection and marketing.	
Insignificant producer share of dairy product retail prices (especially in the formal marketing channel).	Improve vertical coordination in dairy value chain.	
High costs of processing and regulatory burden.	Increase capacity utilization and cost efficiency at processor level.	
Competitively priced imported dairy product.	Processor and collection centres should reduce payment delays.	
	Collection centres and processor should find ways to offer more competitive prices to producers.	

Policy and industry

Inadequate public expenditure in key areas affecting productivity.

Increase public expenditure in key challenging areas to increase productivity and investment in the dairy industry.

The government should provide incentives for private sector investment in the dairy industry and research targeted to poor, rural smallholders to encourage their participation in the dairy sector.

Strengthen the dairy development board and related stakeholders.

Create incentives, including tax breaks, for the private sector to invest in the dairy sector.

Policy advice is not being appropriately targeted to the needs of smallholder farmers.

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