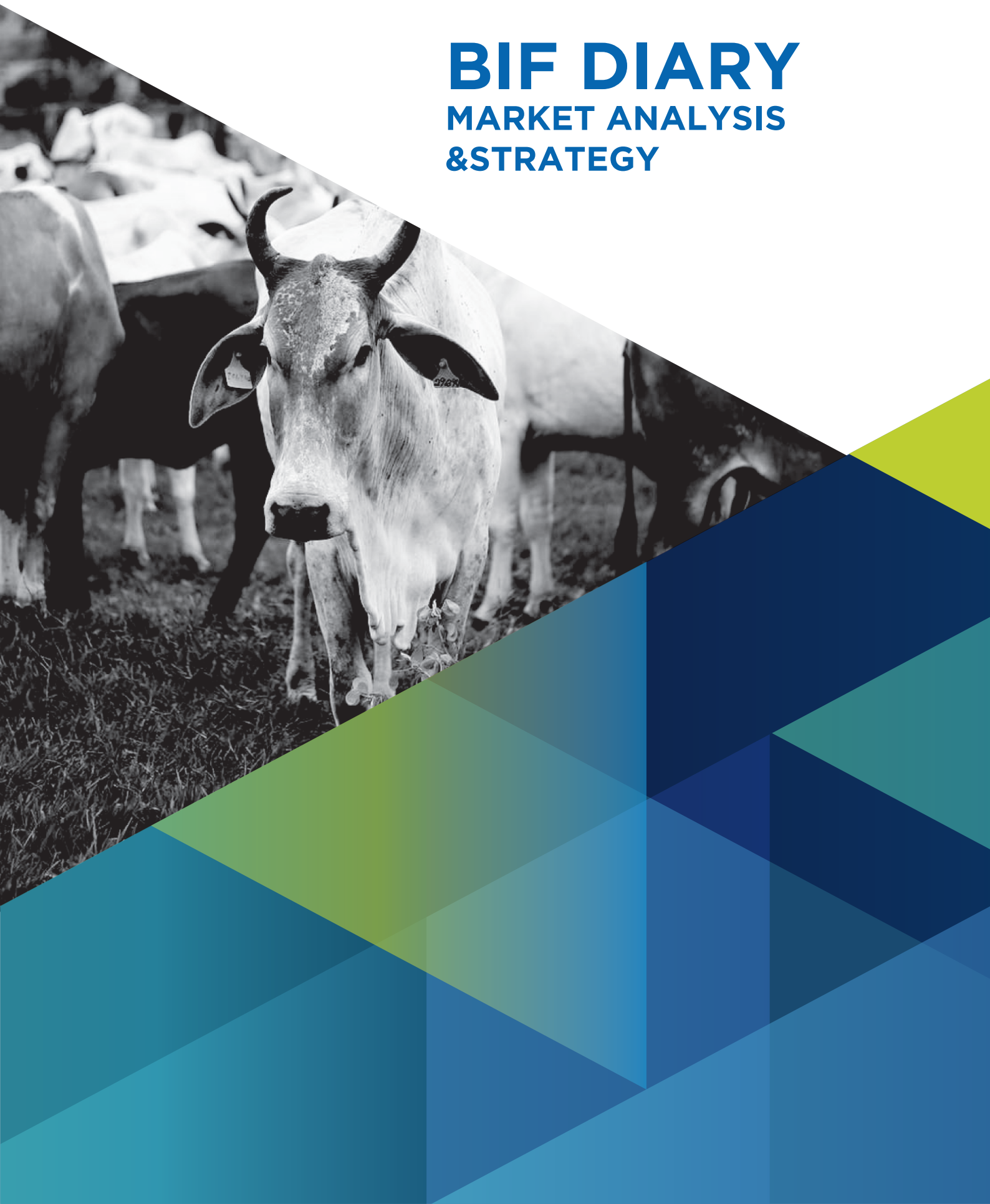




BIF DIARY

MARKET ANALYSIS & STRATEGY



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Acronyms

ADPs	Agricultural Development Projects
AI	Artificial insemination
ATA	Agricultural Transformation Agenda ARCN Agricultural Research Council of Nigeria
BQ	Black Quarter
CADP	Commercial Agriculture Development Project
CAGR	Compound annual growth rate
CAHW	Community animal health workers
CBPP	Contagious Bovine Pleuropneumonia
CP	Crude protein
F1	First generation
FMD	Foot and Mouth Disease
GDP	Gross domestic product
MACBAN	Miyetti Allah Cattle Breeders Association of Nigeria
MANCAP	Mandatory Conformity Assessment Programme
NAFDAC	National Agency for Food and Drug Administration and Control
NAPRI	National Animal Production Research Institute

Acronyms

NCNE	National Commission for Nomadic Education
NIS	Nigerian Industrial Standards
NITR	Nigerian Institute for Trypanosomiasis Research
NLPD	National Livestock Project Department
NVRI	National Veterinary Research Institute
R&D	Research and development
SON	Standards Organization of Nigeria
TMR	Total mixed ration
TNV	Total digestible nutrients
NAPRI	National Animal Production Research Institute
NCNE	National Commission for Nomadic Education
NIS	Nigerian Industrial Standards
NITR	Nigerian Institute for Trypanosomiasis Research
NLPD	National Livestock Project Department
NVRI	National Veterinary Research Institute
R&D	Research and development
SON	Standards Organization of Nigeria
TMR	Total mixed ration
TNV	Total digestible nutrients

Executive Summary

Nigeria is the largest producer of milk in West Africa, producing nearly 560,000-570,000 tonnes per year or 13% of production in the region. Currently, Nigeria's output of milk per cow per day is about 1 litre, compared to other African countries like Kenya and Uganda with between 30 to 40 litres of milk per cow per day. Compared to Africa and Asia's average of 0.9 million tonnes and 6.6 million tonnes, respectively, Nigeria's 0.6 million tonnes of milk production is the lowest in the world, according to PricewaterhouseCoopers (PwC) Nigeria.

Dairy is the second largest segment in the Food & Beverages industry in Nigeria, with the overall industry growing at a compound annual growth rate (CAGR) of 8% since 2010 and domestic production growing at a CAGR of 3% between 2000 and 2013. Domestic milk production is concentrated in the savannah areas of northern Nigeria, which is often referred to as the Cattle Belt, and parts of south-western Nigeria.

Not only is dairy a significant and growing industry in Nigeria, it is also a particularly important sector for poor households. There are an estimated 12 million Fulani pastoralists involved in cattle rearing and milk production, who account for over 90% of domestic milk production.

The livelihoods of pastoral households revolve around the milk economy, with dairy production providing an affordable source of food and nutrition and a significant source of regular cash income for pastoralists.

Proceeds from the sale of milk are managed by women and used for food, clothing, medical bills, and soap. Most of the other needs of women and



children are catered for by income generated from the sale of milk and dairy products. Hence, higher volumes of milk production are associated with improved livelihoods, particularly for women in pastoralist households.

There are significant opportunities for the development of the dairy market, in particular to meet growing demand from both traditional market segments and the modern dairy segment. Since domestic milk production is insufficient to meet the growing national demand for milk, a substantial amount of milk is imported to bridge the gap between local milk supply and demand. In 2013, the national demand was estimated at 1.7 million tonnes, with a supply gap of over 1.1 million tonnes.¹

However, the recent oil shocks to Nigeria's economy and the consequent rationing of foreign exchange away from imported goods and services is leading industries to more urgently consider local sourcing and import substitution.

At the same time, industry experts expect strong potential demand for both high and

¹<https://thenationonline.net/diversification-push-value-chain-addition-agric/>
¹Augusto Research. 2014 Dairy Industry Report.

low end dairy products. Similar to global trends, the main drivers for consumption include the growing population, increasing urbanisation, and rising per capita income.

The relatively low per capita dairy consumption in Nigeria (10 litres per head versus 28 litres per head in Africa) also means that there are significant prospects for increased per capita consumption.

Analysis of the market reveals a number of problems that currently constrain the ability of poor pastoralist producers from taking advantage of these growth opportunities. These constraints are linked to weaknesses in several main supporting functions:

- (1) feed and forage,
- (2) breeding (artificial insemination) and related animal health services,
- (3) extension and information services
- (4) preservation systems and cold chain.

In terms of feed and forage, feed companies in Nigeria produce mainly poultry feed and have only recently started producing ruminant feeds because of interventions by donor projects and the Federal government of Nigeria's Agricultural Transformation Agenda (ATA).

However, these ruminant feeds require some adjustment in formulation for it to be appropriate for milk production. To resolve this problem and widen their market, some of these feed companies have engaged the services of experts in the last year to guide formulation and production of appropriate feed for milk production but targeting small commercial farms and have shown very

little interest in pastoralists as potential players in the production of feed for milk production.

Continuous shrinking of the grazing reserves, conflicting use of arable land between crop farmers and pastoralists, compounded by seven month dry season in Nigeria have led to overgrazing and significant reduction in forage available for pastoralists.

This is further exacerbated by the quality of Nigerian tropical pasture known to be low in protein and high lignin content, resulting in low digestibility coefficient, thus poor nutritional and low milk yield for pastoralist dairy cows.

Pastoralist cultural preference for inbreeding rather than artificial insemination and other animal health related services designed to continuously improve breed genetics for high yield milk production, has resulted in continuous propagation of breeds with low milk genetics and the use of animals that are more genetically suited for beef production than for milk production.

In terms of extension services, the Agricultural Development Projects (ADPs) of the State Ministries of Agriculture are charged with provision of extension services. Unfortunately, these public extension agents are trained on general livestock matters so lack specialist knowledge of dairy farming, in particular related to local feed formulation, growing of nutritious pasture, herd health management, breeding management, and hygienic collection and storage of milk. This is compounded by the acute inadequacy of extension workers in the country, with a ratio of one extension worker to ten

thousand farmers (1:10,000) so pastoralists lack access to good information on Livestock practices to adopt.

The short shelf life of milk combined with the lack of Milk Collection Centres (MCCs) and cold chain facilities hampers high volume aggregation and potential to build up sufficient volumes to meet the throughput of the processors.

The absence of this support function limits the pastoralist access to the premium price paid by processors price (as the premium on open market prices is paid for better quality and adequate volume).

In addition, the traditional storage practices are usually associated with high risk of spoilage, reducing pastoralist income further.

Our vision of change for the dairy sector is to improve pastoralist returns from milk production through improved productivity and access to higher prices. To realize this vision, BIF will be pursuing four key interventions:

Intervention 1: Improving year-round availability of forage by promoting commercial production of forage

Intervention 2: Increase access to commercial and public breed improvement and related services.

Intervention 3: Improving access to modern

dairy farm management practices through better extension services.

Intervention 4: Improving access to adequate storage and appropriate preservation services.

The thrust of BIF's portfolio of interventions is to develop viable business models that will motivate expansion of private service participation and investment in the dairy value chain. These business models will be the basis of the project leveraging on creative and innovative solutions to increase the income of pastoralist groups from milk production.

In intervention 1, we propose to focus on making affordable and appropriate feed and forage available all year round for pastoralists to feed their genetically improved dairy cattle (which we propose to work on in intervention 2).

In intervention 3, our vision is to provide the pastoralists with packets of extension information they can distribute and propagate within their communities (and our effort would be to align private interests with theirs and public services providers of such information) Private providers will invest and provide aggregation service via profitable milk collection centres.

This will ensure increased income for the pastoralists and private service providers providing support functions profitably (intervention 4).

Introduction to the market

2.1 Global Context

Dairy is an important agricultural industry globally. It actively contributes to the economies of both developed and developing countries and engages around 150 million small-scale dairy households.²

The livestock industry, which includes the production of milk, meat, and eggs, contributes up to 80% of agricultural gross domestic product (GDP) in developing countries and is classified by the World Bank as one of the fastest growing high-value agricultural markets in many developing countries.³

The global value of milk production represents between 8.5 and 10.5% of all agricultural products each year.⁴

World production has increased significantly over the past decades, and the positive growth trend is forecasted to continue in the long term. In the last three decades, world milk production has increased by more than 58 percent, from 522 million tonnes in 1987 to 828 million tonnes in 2017. India is the world's largest milk producer, with 21 percent of global production, followed by the United States of America, China, Pakistan and Brazil. global milk production is forecast to increase to 829 million tonnes in 2018 – expanding by

16.7 million tonnes, or 2.1%, from 2017 and registering its fastest growth since 2014. In Africa milk output was 45.7 million tonnes almost unchanged from 2016 with highest output in South Africa, Algeria and Tunisia largely offset by lower production in Sudan, Ethiopia, Somalia and Tanzania. In Asia milk rose 1.9% contributed largely by India and Pakistan compensating for declines in China and Turkey.

The growing share of dairy production from developing countries is mainly attributed to an increase in the number of milk producing livestock. In contrast, 70% of the gains in developed countries are due to an increase in milk yields per animal.⁷

Milk production is projected to increase by 23% by 2024, when compared to the base years of 2012-2014.

While increased production in Asia is expected to account for most of the increase, production is forecasted to rise in all regions.⁸

In particular, developing countries are expected to account for 74% of increases in milk production in the next decade, with India and China generating 38% of the gains.⁹

More than 6 billion people consume milk and other dairy products on a daily basis, with the majority of these people living in developing countries.¹⁰

Not only does milk and other dairy products provide livelihood opportunities to the large number of actors along the dairy value chain but they also contribute significantly to food security and nutrition.

It is a vital source of dietary energy, fat, and protein. Dairy products are also rich in nutrients, such as calcium.

This is particularly important for combating malnutrition among the poor, who often rely on starch or cereal based diets with minimal diversity.¹¹

For 2014, the annual consumption of dairy products was estimated at 108.9 kg per capita. The per capita consumption for developing countries was 77.5 kg, which is significantly lower than that of developed countries (221.9 kg).¹²

According to the International Dairy Federation, there is a noticeable trend towards increasing global demand for dairy products.

For example, expanding consumption in developing countries reflects increasing populations, income growth, globalisation

of diets, and improved access to refrigeration. Per capita consumption of dairy products in developing countries is forecasted to increase much faster than in developed countries (2% versus less than 1% per annum respectively).

Fresh dairy products, which is the most widely consumed dairy products in developing countries, is projected to account for 70% of the additional dairy consumption. Processed milk products (such as cheese, butter, and milk powder) are also gaining more importance in many countries, albeit constituting a much smaller share of consumption.

Among processed products, butter consumption is expected to grow the fastest while cheese will continue to have the largest share.¹³

Over the next decade, international trade in dairy products is expected to grow, with Asia and Africa being the main destinations. With dairy consumption in developing countries expected to grow faster than domestic production, higher exports are forecasted for New Zealand, United States, European Union, Australia, and Argentina.

These are the main exporters of dairy products, with New Zealand being the largest milk exporter. Trade in dairy products accounted for an estimated 9.2%

¹ https://www.google.com/search?rlz=1C1SQJL_enNG792NG792&ei=jUX6XlzuNOiMfAPn-ah0AI&q=2017+2018+global+milk+production+statistics&oeq=2017-2018+global+milk+production&gs_l=psy-ab.1.3.33i22i29i30i5.2053976.2067949..2080181..0.0.0.6607.20766.2-1j1j1j9-3.....0.....1j2..gws-wiz.....0.0j0i13lj0i8i30.i21hvu1obz

² <http://www.fao.org/3/19210EN/19210en.pdf>

³ Meridian Institute. Innovations for Agricultural Value Chains in Africa: Applying Science and Technology to Enhance Cassava, Dairy and Maize Value Chains, Dairy Value Chain Overview.

⁴ International Dairy Federation (2013). The Economic Importance of Dairying: IDF Factsheet February 2013.

⁵ BIF calculations based on FAOSTAT database, retrieved on 17 Aug 2015: faostat.fao.org/

⁶ FAO Dairy Gateway; BIF calculations based on FAOSTAT database, retrieved on 17 Aug 2015: faostat.fao.org/.

⁷ FAO Dairy Gateway.

⁸ OECD/FAO (2015). OECD-FAO Agricultural Outlook 2015-2024.

⁹ OECD/FAO (2013). OECD-FAO Agricultural Outlook 2013-2020: Highlights.

¹⁰ FAO Dairy Gateway.

¹¹ FAO (2013). Milk and dairy hold potential for improving nutrition of world's poor: www.fao.org/news/story/en/item/203977/icode/

¹² FAO (2015). Food outlook: Biannual Report on Global Food Markets, May 2015.

¹³ OECD/FAO (2015). OECD-FAO Agricultural Outlook 2015-2024.

of global production in 2017 (71.1million tonnes in milk equivalent). On the demand side, China is the leading dairy importer, although increasing self-sufficiency in milk and dairy products has tempered demand. With international prices falling over the past year, this is expected to stimulate further imports into Africa, particularly among Algeria, Egypt, and Nigeria.¹⁴

2.2 National Context

Nigeria is the largest producer of milk in West Africa, accounting for 13% of production in the region. However, on the global scale, it produces less than 0.1% of total milk production. Milk production in Nigeria is predominantly from cows, and unlike many other countries, no distinction

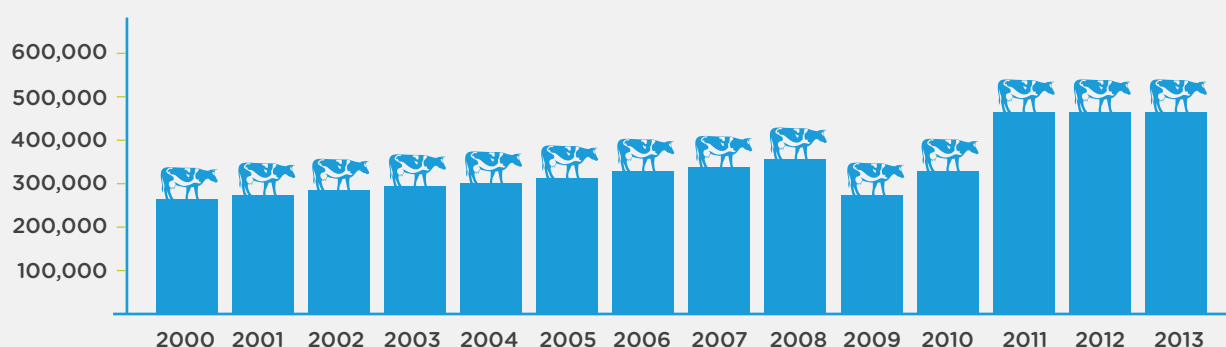
is made between beef and dairy cattle breeds in Nigeria.

In 2013, there was an estimated 20 million cattle in the country, of which 2.37 million were used for milk production.¹⁵

The average growth rate for domestic milk production, which was 3% per annum between 2000 and 2013, was lower than the compound annual growth rate (CAGR) for Africa (4.2% over the same period).

In recent years, domestic production has slowed down, with the annual growth rate at less than 1% since 2011 and production hovering around 560,000-570,000 tonnes/year.

Figure 1: Cow milk production in Nigeria (2000-2013)



Local milk production is highly seasonal, with milk yields in both seasons being well below international benchmarks. Milk production is highest during the peak period of the wet season from July to September and lowest during the peak of the dry season (especially from January to April).

This is associated with the availability of feed and water during the two seasons. Average

milk yield per cow per day in Nigeria has remained flat over the past decade at approximately 0.69 litres/day.¹⁶

As a result, any growth over the past decade is almost entirely the result of an increase in the number of milk producing cattle. Yields have been as low as 0.3 litres/day in nomadic production systems while in settled systems with crossbred cows the average is 2 litres/day.¹⁷ In comparison, the global average is 6.6

litres/day, and the average for Africa (1.4 litres/day) is double that of Nigeria.¹⁸

Milk yields in developed countries can reach over 30 litres/day, and the average yields in the United States is 28.8 litres/day.

Domestic milk production is concentrated in the savannah areas of northern Nigeria, which is often referred to as the Cattle Belt, and parts of south-western Nigeria. The concentration of livestock in the North is associated with the availability of savannah grasslands and low incidence of tsetse flies in this region.

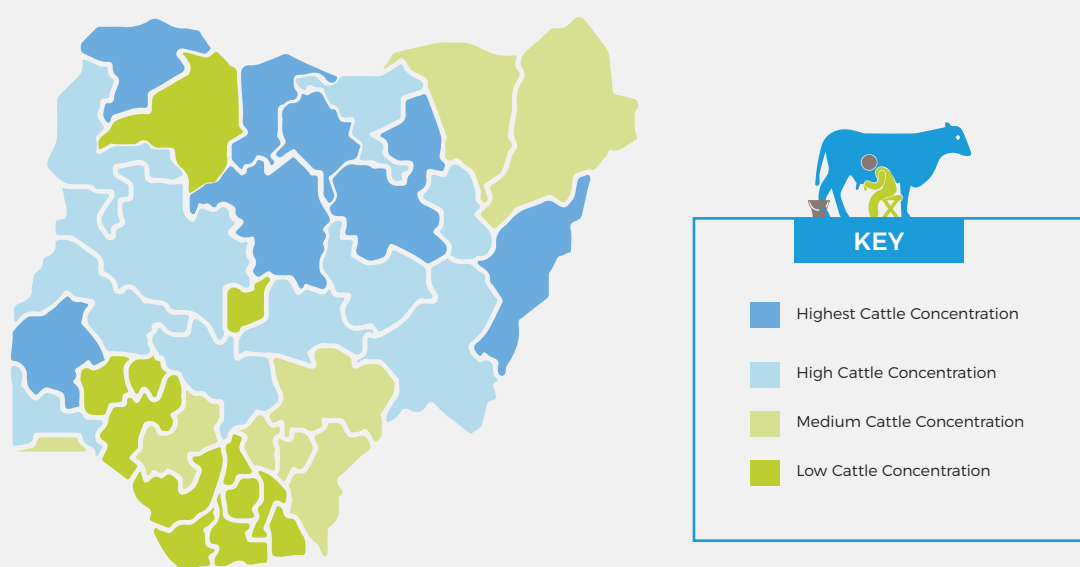
The highest concentration of cattle is in Sokoto, Katsina, Kano, Kaduna, Bauchi, Adamawa, and Oyo States. While cattle and milk production has historically been high in the North East, the insurgency in Yobe, Borno, and parts of Adamawa States has resulted in a migration of cattle and milk

producers, primarily to the Republic of Cameroon and Chad.

Commercial dairy farms are concentrated along the Zaria-Kaduna-Abuja axis. However, large-scale cattle rustling over the last four years has forced the closure of many of the commercial farms in these areas and has also affected pastoralist milk producers especially in parts of Zamfara, Katsina, Kaduna, Nasarawa, Kogi and Niger States, as well as FCT Abuja. The areas with the highest incidences of cattle rustling are the southern parts of Zamfara, western parts of Kaduna, and northern parts of Niger States. Cattle rustling happens at a smaller scale around FCT Abuja and in Plateau State, the central parts of Kogi State, and the southern parts of Katsina.

Finally, it is sporadic in Nasarawa and relatively low in other areas of the country.

Figure 2: Main milk producing areas (using cattle concentration as a proxy)



¹⁴ FAO (2015). Food outlook: Biannual Report on Global Food Markets, May 2015.

¹⁵ The last official survey on the dairy population was in the 1991 Livestock Resource Survey, which reported a cattle population of 13.9 million.

These figures are estimates reported on the FAOSTAT database

¹⁶ FAOSTAT database. Hg/an converted to litres/day/animal assuming 1kg= 1.033 litres and 365 days.

¹⁷ IFDC (2012). Dairy Development Programme in Nigeria Baseline.

¹⁸ FAOSTAT database. Hg/an converted to litres/day/animal assuming 1kg= 1.033 litres and 365 days.

Although Nigeria has a long tradition of milk production, the role of dairy products in traditional diets has varied greatly across different regions of the country.

Per capita dairy consumption is also relatively low. Per capita dairy consumption in Nigeria is less than 10 litres/head. In contrast, the global average is 40 litres/head and other Africa countries are consuming 28 litres/head.¹⁹

Since the cattle corridor is in the North, fresh and locally processed milk products have traditionally been part of the local diets in this region. Local dairy products are widely available in both urban and rural market outlets in these states.²⁰

The North tends to consume far more dairy products in their diets than the South. The indigenous populations of southern Nigeria, notably the Yoruba and Igbo, did not traditionally rear cattle for milk. Their consumption of dairy products has, however, increased over the past decades, in part due to permanent and seasonal migration of cattle rearers from the North and increased availability of milk imports.²¹

Dairy consumption tends to be higher during the hotter seasons, which coincides with the dry season when domestic production is lowest. As a result, prices of local dairy products tends to be highest in the dry season.²²

The relatively low per capita dairy consumption, with many households not consuming milk, means that there are significant prospects for growth. Dairy consumption patterns are undergoing dramatic changes, with strong potential

demand for both high and low end dairy products. Similar to global trends, the main drivers for consumption include the growing population, increasing urbanisation, and rising per capita income.

Particularly in urban areas and among the middle class in Nigeria, increased health consciousness and changes in lifestyle are also leading to shifts in demand for higher end dairy products.²³

According to a 2014 industry report, the entire dairy industry is the second largest segment in the food and beverage industry in Nigeria, generating an estimated revenue of N345 billion in 2013 and growing at a CAGR of 8% since 2010. Among the various segments which make up the dairy industry (milk, yoghurt, ice cream, butter, infant formula), milk has the largest share and accounts for 61% of the turnover in the industry.²⁴

Nigeria's ice cream market alone is estimated at 10 million litres, with a value of approximately \$40 million per year.²⁵ For the forecast period of 2014 to 2019, drinking milk products (which includes fresh milk) are expected to increase by a value CAGR of 3% at constant 2014 prices, and yoghurt and sour milk based drinks (which includes the sour milk that is traditionally available in unpackaged forms) are forecasted to increase by a value CAGR of 2% at constant 2014 prices.²⁶

Premium products such as non-fat, low-fat milk, milk cubes, and milk-based energy drinks are becoming increasingly popular among high and medium income consumer segments.²⁷

¹⁹ Foraminafera. "Milk Production in Nigeria: The Opportunities" (28 November 2012). Retrieved on August 16, 2015: www.foramifera.com/index.php/news-and-press-release/item/234-milk-production-in-nigeria-the-opportunities

²⁰ Dr. Akinyosoye (2005). Demand for Dairy Products in Nigeria.

²¹ Jabbar and Reynolds (1989). "Milk marketing and consumption in Nigeria." International Livestock Centre for Africa Annual Report 1989.

²² Garba and Momale. Context Study and Mapping for design of a Livelihood Programme in Bauchi State for Oxfam in Nigeria.

²³ USDA (2013). Gain Report: Nigeria Food Processing Ingredients Market 2013; DAIRYCHAIN Programme (2014).

DAIRYCHAIN Newsletter: October 2013-March 2014. Issue No. 1.

In response to changing consumption trends in urban centres (particularly in the South), commercial processors are introducing numerous marketing and product innovations to attract new dairy consumers.

Examples of the innovation and dynamism in the Nigerian dairy industry include the introduction of flavored milk based drinks (targeting children); smaller packaging of milk-based drinks (targeting price-sensitive consumers and school-age children); small sachets for condensed/evaporated milk (targeting those using milk complements for tea and other beverages and foods); and increased visibility and widened distribution of smaller commercial players in certain dairy segments.²⁸

Since domestic milk production is insufficient to meet the growing national demand for milk, a substantial amount of milk is imported to bridge the gap between local milk supply and demand. In 2013, the national demand was estimated at 1.7 million tonnes, with a supply gap of over 1.1 million tonnes.²⁹ Imported milk powder is the dominant input into the dairy industry, accounting for over 75% of inputs. Nigerian dairy processors are known to import and repackage milk powders or to reconstitute imported milk powder into liquid milk and other dairy products.³⁰

The use of imported milk powder is a growing practice among yoghurt processors and is also the main input for locally produced ice cream.³¹

Imported milk powder (whole and skimmed) was estimated to be worth

approximately \$425 million in 2012, and the value of all dairy imports was estimated at \$521 million (or 7.4% of the value of all agricultural imports) in 2012.³² Industry analysts expect the dairy industry to remain dependent on imported milk powder in the medium to long term. The EU, in particular Denmark and the Netherlands, are the dominant sources of milk powder for Nigeria.³³ As noted above, reduced global price is forecasted to lead to growth of imports in Africa, with Nigeria expected to be among the principal import destinations.

However, the recent oil shocks to Nigeria's economy and the consequent rationing of foreign exchange away from goods and services are also likely to lead to an increase of local milk and dairy products sourcing and import substitution.

Not only is dairy a significant and growing industry, it is also a particularly important sector for poor households, with many relying on dairy as producers, consumers, and labourers. There are an estimated 12 million Fulani pastoralists involved in cattle rearing, many of whom are also involved in milk production.

Over 90% of domestic milk production is derived from Fulani milk producers (with commercial dairy farmers accounting for the remainder of local milk supply).³⁴

There is a high concentration of Fulanis/Hausas in many of the poorest states in Nigeria, particularly in the top ten poorest states (Yobe, Zamfara, Bauchi, Kebbi, Jigawa, Sokoto, Katsina, Gombe, Taraba, and Kano).³⁵

²⁴ Augusto Research. 2014 Dairy Industry Report; In 2010, the Central Bank of Nigeria valued the industry at N450 billion while the USDA's Exporter Guide for Nigeria 2013 estimated that the industry is worth an \$3 billion.

²⁵ USDA (2013). Gain Report: Exporter Guide for Nigeria 2013.

²⁶ Euromonitor International (2014). Dairy in Nigeria: Executive Summary. Retrieved on August 19, 2015: www.euromonitor.com/dairy-in-nigeria/report

²⁷ Euromonitor International (2014). Dairy in Nigeria: Executive Summary. Retrieved on August 19, 2015:

²⁸ USDA (2006). Gain Report: Exporter Guide for Nigeria 2006.

²⁹ Augusto Research. 2014 Dairy Industry Report.

³⁰ CNBC Africa (2014). "Understanding Dairy Imports in Nigeria." Retrieved on August 15, 2015: <http://www.cnbcfric.com/news/western-africa/2014/05/19/understanding-dairy-imports-in-nigeria/>

³¹ USDA (2013). Gain Report: Exporter Guide for Nigeria 2013.

³² BIF calculations based on FAOSTAT database (all dairy imports is based on 'milk equivalent' category).

³³ USDA (2013). Gain Report: Exporter Guide for Nigeria 2013.

As a result, dairy production can be a significant source of regular cash income for poor smallholder producers. The livelihoods of pastoral households revolve around the milk economy.

Proceeds from the sale of milk are managed by women and used for food, clothing, medical bills, and soap. Most of the other needs of women and children are catered for by income generated from the sale of milk and dairy products.

Hence, higher volumes of milk production is associated with improved livelihoods, particularly for women and children in pastoralist households. Fulani women and girls are also the main actors in the hawking of dairy products, with many girls being taken out of schools to hawk dairy products.

To the mainly poor and rural pastoralists, cattle is not only a source of cash income (through milk, meat, and cattle sales) but it also has a strong social and cultural significance in relation to marriages, deaths, dispute settlements, and gift giving.

For example, the handing over of cattle as part of the dowry is an important part of the Fulani marriage tradition. Social prestige and status is also closely interlinked with the number of cows a pastoralist owns. Furthermore, given that a significant proportion of the milk produced is consumed by pastoralist households, the dairy sector also provides a dominant and affordable source of food and essential nutrition, particularly protein, for these families.

Sector Snapshot



Geographic focus for BIF2

**TARGET POOR
BENEFICIARIES**

Without prejudice to our planned studies to be carried out we have identified two states of Kaduna and Katsina for pilot which we hope to scale to Kano, Sokoto, Jigawa and Kebbi in Northern Nigeria because of high cattle concentration and poverty rate in

these states BIF's target poor beneficiaries in the dairy market are poor producers, with an estimated number of poor producers in the geographic target area. Dairy contributes an estimated 62% to household income of these poor producers

¹⁹ Foraminafera. "Milk Production in Nigeria: The Opportunities" (28 November 2012). Retrieved on August 16, 2015: www.foraminafera.com/index.php/news-and-press-release/item/234-milk-production-in-nigeria-the-opportunities

²⁰ Dr. Akinyosoye (2005). Demand for Dairy Products in Nigeria.

²¹ Jabbar and Reynolds (1989). "Milk marketing and consumption in Nigeria." International Livestock Centre for Africa Annual Report 1989.

²² Garba and Momale. Context Study and Mapping for design of a Livelihood Programme in Bauchi State for Oxfam in Nigeria.

²³ USDA (2013). Gain Report: Nigeria Food Processing Ingredients Market 2013; DAIRYCHAIN Programme (2014). DAIRYCHAIN Newsletter: October 2013-March 2014. Issue No. 1.

Key market statistics and trends

20million

Herd size: 20 million in the country, of which 2.37 million were used for milk production

0.69 litres

Low, unchanging milk yields: Average yield remained at ~0.69 litres/cow/day over the past decade



570,000

Large role of imports in meeting national demand but trend towards increased local sourcing: Domestic milk production was 570,000 tonnes in 2013 while national demand was ~1.7 million tonnes.

The recent oil shocks to Nigeria's economy and the consequent rationing of forex away from goods and services are leading industries to more urgently consider import substitution

Growing domestic milk production and dairy industry: Dairy is the 2nd largest segment in the Food and Beverages industry in Nigeria, growing at a CAGR of 8% since 2010. Domestic milk production grew slower than the overall industry, at a CAGR of 3% between 2000 and 2013.



Strong growth opportunities for both milk and high end dairy products:



(1) Substantial opportunity for increased per capita consumption given low per capita consumption of 10 litres/head (vs. 40 litres/head globally and 28 litres/head in Africa);

(2) Increasing urbanisation and rising per capita income is driving increased demand for value-added and/or premium dairy products

³⁴DAIRYCHAIN. <http://www.dairychain.org/index.php/component/k2/item/93-a-complementary-dairy-development-program-takes-part-in-the-dairychain-stakeholders-meeting-in-nigeria>

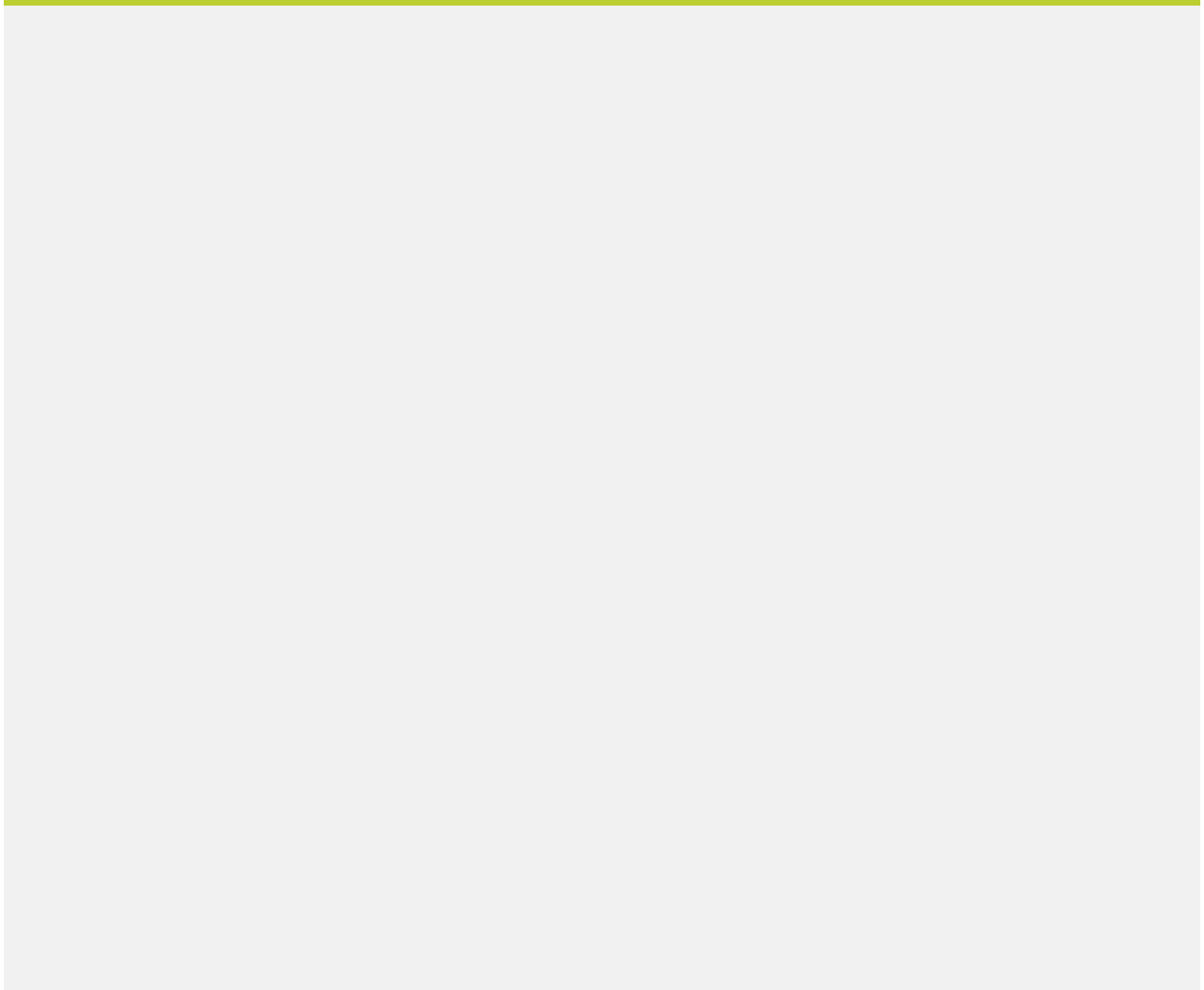
³⁵ Oxford Poverty and Human Development Initiative (2015). OPHI Country Briefing June 2015: Nigeria

Market structure and performance

3.1 Overview of the market system

The dairy market system is defined as the core market, support systems, and the formal and informal rules that govern the market. These three components, which are represented in Figure 4, are analysed in the following sections.

Figure 5: M4P donut-style map for the dairy market system



As shown in Figure 5, the dairy sector in Nigeria can be classified into two systems: (1) traditional dairy processing and marketing and (2) modern dairy processing and marketing.

The traditional system involves small-scale, household production of local dairy products by Fulani pastoralists and the marketing of these products through informal channels, predominantly to rural or semi-urban consumers.

This is the dominant system in Nigeria. The modern system involves commercial dairy processors³⁶ and integrated farms that will use imported milk powder and/or

source milk through organized milk collection systems from pastoralists, small commercial dairy farms, and their own farms.

These companies produce modern dairy products such as pasteurized milk, yoghurt, and ice cream.

These products are mainly targeted at urban consumers and are sold through the modern retail segment. The following section will discuss a number of the core market functions within each of the two dairy systems, including production, collection/aggregation, processing, and trading.



³⁶ For the purposes of this MAS, we define commercial dairy processors as those which are only involved in processing and integrated dairy farms as those who are involved in both milk production and milk processing.

3.2.1 Traditional dairy processing and marketing

Production

Milk production is the main business for many of the 12 million Fulani pastoralists in Nigeria, with approximately 13% of each cattle herd being used for milk production. Apart from increasing involvement in crop cultivation, pastoralists generally have few alternative income generating activities. Even when engaging in farming, this is primarily for subsistence rather than for commercial sales.

While farming is not part of the Fulani tradition and culture, it has increased over time because the milk economy is no longer sufficient to provide for the Fulani's daily household needs. This has been accompanied with a trend towards larger household sizes, smaller numbers of livestock per household, and increased household expenditures (e.g. as a result of higher demand for schooling). Although annual cattle sales per household can vary between 2-5 cows (accounting for an average of 38% of annual household income), most families will only sell their cows as a last resort and do not consider themselves to be in the business of selling cows.

Unlike milk sales, cattle does not provide a source of regular cash income for households and is usually only sold if large amounts of money is needed, particularly for marriages, deaths, and emergencies.

Pastoral producers of milk can be classified into three main production systems—sedentary, semi-sedentary, and nomadic. Sedentary pastoralists are Fulani who have established permanent dwellings near villages or towns. They tend to serve the nearby rural communities and are rarely found in large concentrations. They have the smallest herd sizes. In addition to raising livestock, almost all of these Fulani also engage in crop cultivation. Unlike sedentary

pastoralists, semi-sedentary pastoralists have higher livestock holdings and only tend to establish temporary settlements for 2-3 years before moving to a new location. Since they have temporary residences, many of these pastoralists are also involved in farming. Nomadic herders have neither permanent nor temporary residences. They are constantly on the move, relocating every 3-4 weeks depending on grazing conditions. The entire family will travel with the herd from one grazing area to another, alternating between the North and South in response to seasonal changes. As a result of their itinerant nature, they do not engage in farming. Nomadic pastoralists generally have the highest numbers of livestock holdings.

In all three systems, pastoralists will search for the best conditions for raising their herds and will move their herds to more suitable grazing lands and water sources. While mobility is an important aspect of pastoralism, the distances that pastoralists will move their herds vary depending on the production system. Sedentary and semi-sedentary pastoralists will rarely exceed 100km when moving their herd. Very few sedentary farmers will practice long distance transhumance, which is the seasonal movement of livestock towards dry season grazing areas typically in southern Nigeria. Nomadic herders will move their cattle over long distances, travelling 100-200km in each direction to reach wet or dry season grazing areas. They will even move their cattle across national boundaries if necessary.

Over the past decades, increasing numbers of pastoralists have taken up a more sedentary lifestyle, and sedentary pastoralists now account for nearly half of the Fulanis. In general, there is a preference among Fulanis to become settled. According to officials of the National Livestock Development Programme, the majority of pastoralists prefer to be sedentary and to raise animals within the precinct of their homestead.³⁷

The nomadic lifestyle is particularly strenuous, with greater risks of grazing conflicts and security issues, especially given the encroachment of traditional cattle migration routes.

The ability to settle is often dictated by the number of livestock owned by a household — the more livestock that a household owns the greater the need to be migratory. However, as noted above, herd sizes have been decreasing over time.

This is associated with the hereditary nature of cattle ownership where the herd is divided across an increasing number of children in each household.

Inheritance and cattle breeding are the main ways that Fulani households acquire cattle and increase their herd size. Cattle is typically passed on to children when they reach adulthood or as part of the dowry in a daughter's marriage. Cattle is also often given as a gift to strengthen kinship relationships or to assist relatives during a calamity. There are also arrangements where a pastoralist is provided a female cow to rear by a relative. In these arrangements, they are allowed to keep either the offspring or the female cow after calving.³⁸

The purchase or bartering of cattle to increase herd sizes is rare among Fulani households.

Pastoralists rely on natural breeding using their own bulls and to a lesser degree shared bulls. They rear only indigenous breeds, which tend to be smaller-framed cattle that are more adapted to harsh climates and low input systems than exotic breeds. The majority of cattle in Nigeria are White Fulani (Bunaaji) cattle.³⁹

Other common native breeds include Sokoto Gudali, Rahaaji, and Bokoloji. These breeds all have horns and have the potential to calve on a yearly basis. However, in general, the period between two successive calving (also known as the calving interval)

is closer to two years. Although these breeds can more easily withstand the conditions in Nigeria, they are still susceptible to Tsetse-flies and also have lower potential milk yields compared to exotic breeds.

When breeding cattle, Fulanis will attempt to select a superior bull that possesses certain desirable characteristics related to weight, size, and historical performance of its parents. Proper bull selection and management is particularly important for improved genetics within a herd.

However, pastoralists rarely practice selective breeding for the improvement of milk yields, and as previously noted, there are no distinct dairy breeds being used by the Fulanis. After a superior bull is selected, all other bulls in the herd are castrated. The use of shared bulls is minimal but can occur when poorer households do not own a bull or when a pastoralist likes the traits of a neighbour's bull.

No payment is collected for the use of bulls from neighbouring households. Artificial insemination (AI) is not commonly practiced, and the Fulanis often use a slightly derogatory nickname for the breeds that are derived through AI.

Background on milk production and lactation cycles

In order for cows to produce milk, they need to give birth to a calf. Each period of lactation can last 12-14 months. It starts at calving (when the calf is born) and terminates around 2 months before the next calving (which is called the dry-off period).

In the pastoral system, cattle are mainly fed through open grazing on native grasses. Since pastoralists rarely have ownership over pasture lands, they do not plant more nutritious pastures. Instead, they regularly move livestock from one area to another in search of more favourable grazing conditions. The three main ways through

which pastoralists access pasture are free access, institutional access, and illegal access.

Free access can occur on uncultivated fields or communal lands. Institutional access refers to the use of government-designated areas for grazing. This includes grazing reserves and some forest reserves. There are also areas where grazing is restricted, including some forest reserves, game reserves, national parks, and communally protected areas of cultural and spiritual importance (e.g. shrines and graves). Some of these lands have been illegally encroached by pastoralists.⁴⁰

Feed is one of the most important inputs for cattle and milk production. Currently, Fulani cows are receiving inadequate feed (both in terms of volumes and quality) for much of the year.

This is the case even in the wet season when cattle have access to uncultivated fields, communal lands, and forest and grazing reserves.

Feed affects reproduction, mortality and growth rates of cattle, as well as the level of milk production. Good cow nutrition is essential for high reproduction rates in cattle. Cows need to be fed a sufficient quantity and quality of feed to maintain body condition, especially in the few months before and after calving when the energy demands of pregnancy and lactation are highest. Poor cow condition at calving results in increased calving intervals and reduced calving percentages.

At the same time, inadequate nutrition in growing calves can delay the development of puberty in heifers. Overall, feed sources used by Fulani herds tend to have low levels of crude protein (CP) and total digestible nutrients (TDN).⁴¹

In the dry season, when pasture is scarce in many of the wet season grazing lands, pastoralists will move their cattle to other areas, including the flood plains known as the Fadama lands and low-lying swampy lands in the South. Almost all of them will also supplement the diet of their cattle with crop residues. In most cases, pastoralists will negotiate with crop farmers to have the right to graze their cattle on recently harvested fields. This includes sorghum, millet, maize, and rice fields and may involve a fee for using the fields. This arrangement is mutually beneficial. Not only does it allow pastoralists to access feed during critical periods, but it also reduces the farmers' labour requirement for clearing the fields before the next planting season and provides farmers with substantial amounts of manure to fertilise their fields.⁴²

Feed purchases are only made by pastoralists during the dry season. In addition to crop residues, which may or may not involve a fee, the majority of pastoralists will also purchase some agro-industrial by-products or hay to feed their cattle in the dry season. Hay can be purchased directly from farmers or markets within towns or peri-urban areas. It is widely used by sedentary and semi-sedentary pastoralists in the dry season. Agro-industrial by-products include cotton seed cake, groundnut cake, and rice offal. Most factories have an organised distribution channel to sell these by-products, which are also used to feed poultry and other ruminants.

The use of processed feed products, such as composite or concentrate feeds, is uncommon among pastoralists.

Cattle also require water, minerals, and vitamins for normal biological functioning and for milk production. Grazing areas are

³⁸ Mamman, A.B (2005). Contribution to Investigations on Building a Food Marketing Policy Evidence Base in Nigeria.

³⁹ FAO (2009). Nigeria-Review of livestock sector with respect to smallholder dairy, livestock, and meat sub-sectors development.

⁴⁰ (2014). Pastoralists Mobility and Access to Resources, Ph.D. Thesis, Department of Geography, Bayero University, Kano.

not only essential resources for natural grasses but also for surface or underground water. Unlike water, which is free, minerals and vitamins are purchased in open markets by all pastoralists. Lactating cows have higher daily water requirement than other cattle in the herd.

They require around 60 litres of water per day depending on the weight of the cow, feed content, and weather. During the wet season, the vast majority of pastoralists will bring their cattle to streams, rivers, or ponds near grazing lands. When surface water is not available, tube wells or artisanal wells are used.

Boreholes and earth dams are rare and are mostly found within grazing reserves, such as the Runka in Katsina State, Kachia and Gayan in Kaduna State, and Bobi in Niger State. In the dry season, access to water at dams in Fadama lands have often resulted in clashes with crop farmers in these areas. As the dry season gets drier, nomadic pastoralists will migrate further south where there are more water sources, along with fresher grasses.

However, for many of the sedentary and semi-sedentary pastoralists, finding watering points in the dry season is a major challenge.

Animal health care is also an important aspect of the production process, especially given the frequent Foot and Mouth Disease (FMD) outbreaks. While the FMD vaccine is not widely available in Nigeria, most pastoralists will purchase drugs to treat cattle for FMD and other common diseases. FMD outbreaks occur every year during the dry season from October to February.

It is highly contagious, affecting 30-40% of all cows nationwide. FMD can result in mortality rates of up to 70-80% for calves; abortions in pregnant cows; and a loss of appetite in cattle, which in turn affects the ability of lactating cows to produce milk.

Other common cattle diseases in Nigeria include Contagious Bovine Pleuropneumonia (CBPP), Black Quarter (BQ), worms, and skin diseases.

Pastoralists typically self-diagnose their cattle and will purchase drugs from patented medicine dealers and quacks. Neither the patented medicine dealers nor quacks have knowledge or training on livestock.

Pastoralists will often vaccinate cattle against some of the other major diseases. These pastoralists will use vaccines that can be purchased from the National Veterinary Research Institute (NVRI) or will attend the government vaccination campaigns which provide free or partially subsidised vaccines. For government vaccination campaigns, pastoralists within the announced area of coverage are asked to bring their animals to a central location where government veterinary officials will vaccinate all the livestock.

The level of coverage varies from state to state and depends largely on the political leadership. When pastoralists purchase vaccines through NVRI, they will usually administer the vaccines themselves rather than pay a veterinarian.

Aside from animal husbandry practices, milking practices can also affect milk production. Both animal husbandry and milking are the exclusive tasks of men. Traditional milking practices, which involves hand milking once a day, are unhygienic and do not conform to best practices in dairy production.

Fulani milking practices are unhygienic since the cow's teats are not bathed before milking and bare hands are used to milk the cows. Calves are also not separated from their mothers. Allowing calves to suckle on the lactating cows (rather than feeding them collected milk) can compromise the health of the teat end. Finally, milking is

mainly done only in the mornings in Fulani households. Best practices, on the other hand, dictate that lactating animals should be consistently milked at twelve-hour intervals in order to reduce losses in milk production. In some cases, during the dry season when feed is inadequate and milk yields are extremely low, some cows are not milked at all to allow their calves to have sufficient nutrition.

The male head of the household often determines the quantity of milk to be left for the calf. At night time, the calf is tethered to prevent it from breast feeding. In the morning, it is released to start breastfeeding in order to activate the glands of the lactating cow. Once the lactating cow begins releasing milk, hand milking commences until a substantial proportion of the milk is collected.

The remaining milk will then be left for the calf. The calf often has the greatest share of the milk as it is allowed to breast feed throughout the day.

Traditional Processing

Generally, pastoral families rarely sell raw milk unless the household is in transit during the transhumance. Most milk is naturally fermented and processed into three main traditional products—Nono, manshanu, and Kindirmo — by women in pastoralist households. Nono is derived from allowing boiled or unboiled fresh milk to ferment overnight. This natural process of fermentation allows the fat contained in the milk to accumulate on the top. The top layer of fat is extracted to make manshanu (local butter), and the remaining portion becomes Nono, a low-fat sour yoghurt. Kindirmo, a sour yoghurt with high fat content, is made in a similar fashion but without extracting the top layer of fat. Fermentation of milk is done in a clay pot vessel or in a calabash. These containers usually have residues of lactic acid bacteria, which act as a starter for the fermentation process.

Retail

Traditional dairy products are mainly hawked by Fulani women from the households that produce the milk. This is done only if there is excess milk after household consumption needs are met.

Typically, only 15-30% of the collected milk is consumed by the household. While the husband determines the amount of milk left for the calf, the wife will determine the quantity of milk to be allocated for household consumption and for commercial sales. She is also responsible for managing the income from milk sales.

In nomadic communities, there is usually 30-40% of households who will not take the processed dairy products directly to the market themselves. These households prefer to sell the already processed products to other milk producing Fulani households, which serve as small-scale aggregators that will hawk the products along with their own processed products.

In either case, it is the Fulani women or girls who are responsible for milk marketing. They will carry the milk products on their heads in calabashes to peri-urban areas, roadside settlements, and rural markets. Since the majority of retailers hawk traditional dairy products, these products are rarely regulated and there are no taxes or other levies being applied to this segment of the market.

Dairy products marketed through the informal market are not cooled and are typically sold immediately after they are processed. Most of Fulani milk is sold as Nono since it is more affordable than Kindirmo. Some pastoral women will also add value to the Nono by mixing it with millet to produce fura da Nono. Although traditional processing techniques do extend the lifespan of milk, the processed products still need to be sold quickly. The conversion of fresh milk to Nono or Kindirmo extends

the lifespan of milk to about 48-72 hours. Local butter in its raw form lasts for approximately one week before it becomes rancid. While the lifespan can be further extended to two months by frying the butter and storing it in liquid form, this is only done at the consumer level.

Fura da Nono, a sour yoghurt-cereal mix, is popular in urban and peri-urban areas. Sedentary pastoralists will often grow their own millet, which they will use to produce the fura da Nono.

3.2.1 Modern dairy processing and marketing

Production

The modern dairy segment relies on three main sources of local milk production. As no more than

5% of pastoralist production is estimated to go for modern processing, most fresh milk for this segment is sourced from independent commercial farms or through on-farm production by vertically integrated farms. Following the oil boom of the 1970s, a number of investors and wealthy individuals attempted to establish western models of dairy farms in Nigeria. By the 1980s, many of these farms had collapsed as a result of high operating costs, inappropriate technologies, and poor management. With increasing demand and liberalisation of the Nigerian market, there was another wave towards establishing commercial dairy farms from the late 1990s. These were established with more efficient management systems and were built on more profitable business models that did not rely on government subsidies.

There are now approximately 20 integrated dairy farms and numerous smaller commercial peri-urban farms. Small commercial farms supply fresh milk to integrated dairy companies and independent aggregators who target

medium scale dairy processors. Prior to the large-scale cattle rustling which started 2 year ago, there was an estimated 28 commercial farms, predominantly in the North. Commercial farms are peri-urban farms without any internal processing facilities. They have dairy herd sizes with no more than 30 cattle, of which 10 will be lactating at any given point in time. Many of these farms are dual purpose cattle farms that also engage in beef farming and will have a maximum herd size of 60 cattle for the entire farm. Examples of small commercial farms include Zaidi Farms, Inter-city Farm, and Raudah Farms in Kaduna; Garko Farms in Kano; and Joda Farm in Yola.

Unlike small commercial farms, vertically integrated farms have much larger dairy herd sizes. Shonga Farm in Kwara State has the largest dairy farm (in terms of land size and head of cattle), followed by Farm Fresh Integrated Farms in Plateau and Sebare Farm in Adamawa. Dairy herd sizes on integrated farms range from 100-700 cows, with about 30-150 lactating at a given time. Shonga Farm, which is owned collectively by five Zimbabwean farmers, produces approximately 8,700 litres of milk per day for its own processing facilities and for sale to the largest dairy processor, Friesland Campina.⁴³



Table 1: Integrated dairy companies (their off-farm sources of milk and rankings in terms of cattle numbers and throughput)

Company	Location	Ranking: number of cattle ⁴⁴	Additional sources of milk supply		Ranking: throughout 45
			Pastoralists	Imported milk powder N	
Shonga Farm	Kwara	Large	Y	N	Large
Farm Fresh	Plateau	Large	N	Y	Large
Sebore	Adamawa	Large	N	N	Medium
Nagari Farm	Nasawara	Large	N	Y	Medium
Niyya Farm	Kaduna	Large	N	Y	Large
Mai Zube Farms	Niger	Large	Y	N	Medium
L&Z	Kano	Medium	Y	Y	Medium
Majestik	Jigawa	Medium	N	Y	-
Milky Way	Plateau	Medium	N	N	Medium
Jamil Farm	Kaduna	Medium	N	Y	Medium
Lamda Farms	Kaduna	Medium	Y	Y	Small
Tilde Farms	Bauchi	Small	Y	N	Small

Cattle breeds used in the modern dairy segment varies depending on the source of milk production. They include exotic breeds (particularly Holstein Friesians), crosses, and to a much lesser degree indigenous breeds. Natural mating is still the most common way of breeding across all three milk production systems. Except for Shonga Farms which uses purely exotic breeds, most integrated farms will use both exotic breeds and crosses (60 to 40 ratio). Holstein Friesian accounts for the majority of exotic cows used in Nigeria. Other breeds that are used include Jersey, Brown Swiss, and Semental.

These are larger framed animals with higher potential milk yields. Crossbreeding of exotic and local breeds can improve the productive potential of local breeds. Crossbreeding is mainly carried out between Holstein Friesian cows and White Fulani or Sokoto Gudali cows. Commercial dairy farms will mainly use crosses and a smaller percentage (~20%) of exotic breeds.

Most pastoralists will use indigenous breeds even when producing milk for the formal dairy sector. Some pastoralists have expressed interest in allowing their cows to be cross-bred, and L&Z is currently conducting a pilot involving the distribution of a small number of crossbred heifers.

Although some of the integrated farms have internal staff that are trained in AI, it is more common for these farms to naturally mate Friesian bulls with local cows to get F1 (first-generation) crosses. Natural breeding is preferred since it is cheaper than AI and also has a higher conception rate. In the rare cases that integrated farms are using AI, they are either importing the semen straws directly from Europe or South Africa or are buying from AI service providers who import from Europe.

Pastoralists who provide milk to the modern dairy segment tend to have similar animal husbandry practices as those who produce for the traditional segment. On the other

hand, commercial farms and integrated farms tend to employ more intensive rearing practices. Both commercial farms and integrated dairy farms will produce own pasture within their farms. Commercial farms will grow approximately 10-20 ha of pasture while integrated farms will plant 150-200 ha of pasture. They mainly plant Rhodes, Gamba, or Brachiaria grasses or legume pastures (such as Stylosanthes) from seeds purchased from the National Animal Production Research Institute (NAPRI).

These grasses and legume trees are more nutritious than indigenous pastures. Commercial farms mainly follow semi-intensive feeding systems.

They feed their herd by letting them graze within the farm perimeter. In the evenings, cattle are also given agro-industrial by-products that are sourced from the market or through agro-dealers. Most of these farms have boreholes on their lands and will bring water to the cattle from these water points.

Unlike small commercial farms, integrated dairy farms tend to use zero-grazing practices, with cattle kept in pens for most of the day. They also produce maize silage and compound their own feed on the farms. They have industrial boreholes or will pump water from dams into large tanks for watering the cattle.

All of the farms have paddocks where cattle are allowed to graze for approximately 2 hours per day in the wet season. In the dry season, these farms will augment available feed sources with conserved fodder (such as hay and silage). Most of the farms have a total mixed ration (TMR) machine where hay, silage, and agro-industrial by-products

are blended to produce a feed that is intended to provide a balance of nutrients for the cow. Very few of the farms have purchased concentrate feed products from feed companies. Two of the farms who had experimented with commercially available concentrates have recently stopped using them since there were quality issues with the concentrate products. It is also cheaper for these farms to compound their own feed.

In addition to having more intensive feeding practices, commercial farms and integrated farms also tend to provide better medical treatment to their cattle. Almost all of these farms have well-trained resident veterinary doctors. Their focus is mainly on prophylactic rather than therapeutic measures. Most of the farms usually also have a veterinarian store on-site which is stocked with drugs that are bought from the open market or are imported from abroad. Vaccines are usually only bought prior to vaccinating the cows.

These are usually purchased from distributors who procure the vaccines from NVRI. In addition to having an in-house veterinarian, integrated farms will also use external veterinarian consultants on a monthly basis.

The services of these consultants are necessary because the dairy operations on integrated farms are more demanding than small commercial farms. While uncommon, there are a few companies (e.g. Lamda Farms and FrieslandCampina) which have provided some animal health services to the pastoralists from whom they source milk. This usually involves making good quality drugs and vaccines available at-cost to pastoralists.

⁴³ UNDP (2013) Nigeria Agribusiness Supplier Development Programme, March 2013.

⁴⁴ Large: >200 animals, Medium: 100-200 animals, Small: <100

⁴⁵ Large: >5000 litres/day, Medium: 1000-5000 litres/day, Small: <1000 litres/day

As a result of the differences in breeds, along with variances in feeding, watering, and animal health practices, milk yields differ significantly across integrated farms, commercial farms, and pastoralists. Milking practices are also different, with smaller scale operations more likely to rely on hand milking. Similar to pastoralists, commercial farms mainly hand milk their cows and only few of the farms have mobile milking machines.

However, their average daily yields are much higher than pastoralists, with an average of 5 litres/cow versus less than 1 litre/cow in pastoralist systems. Integrated dairy farms commonly use mobile milking machines or have standard herringbone milking parlours, which they will use to extract milk from cows twice a day. These farms can extract 8-10 litres/cow/day.

Collection and aggregation

Integrated farms tend to get almost all of their fresh milk from on-farm sources during the dry season. In the rainy season, some of these farms may source up to 40-50% from pastoralists or small commercial farms. Approximately 5 of the 12 farms are currently sourcing some fresh milk from off-farm sources.

Only two farms (Sebore and Milk Way) rely 100% on their on-farm milk production for both seasons and do not use any imported milk powder. A number of other farms such as Farm Fresh and Niyya have previously sourced from pastoralists but are now only using on-farm sources and imported milk powder. Farm Fresh stopped because of the low quality of milk that they were receiving and the clashes between pastoralists and crop farmers in surrounding areas. Niyya Farm stopped because of the impact of cattle rustling on pastoralist milk production.

Both farms are interested in sourcing again from pastoralist herders. Only two of the large dairy processors procure fresh milk, including from local pastoralists. For example, FrieslandCampina has a target of 10% for local milk procurement in the short-term (60 million litres per year by 2016) and 50% within the next 10 years.⁴⁶

Independent aggregators mainly source milk from commercial farms while cooperatives will collect and aggregate Fulani milk. Overall, there are few cooperatives relative to the total number of Fulani producers.

The highest concentration of cooperatives is in Kano and Kaduna because of the larger volumes of fresh dairy processing in these States. There are approximately 64 registered dairy cooperatives in Kaduna with over 500 total members. These cooperatives are male dominated, with women accounting for only 10% of all members. A few women dairy cooperatives also exist, such as Wuro Bogga Women Dairy Processing Multi-purpose Coop Society, Fuldani Kawaji Women Farmers, and Kyarana Women Dairy Marketers Association in Kano.

In recent years, some pastoralists within Kaduna have relocated to Fashola town in Oyo State where there are multiple cooperatives that focus on collecting and selling milk to FrieslandCampina. They have been attracted by the lower risk of cattle rustling in Oyo State and the higher prices provided by FrieslandCampina when compared to Milk Cooperative Associations Limited (MILCOPAL), a milk processor based in Kaduna. The MILCOPAL collection model has failed to provide adequate volumes of milk to MILCOPAL. This is in part because of the refusal of MILCOPAL to negotiate with pastoralists on the price point.

⁴⁶ ICTA (2013) Expanding Dutch corporate involvement in local milk procurement.; IFDC (2012). Dairy Development Programme in Nigeria Baseline.

Since milk needs to be cooled within 2-4 hours from milking, there is only a small window of time to get the milk from the farm gate to processors.

There are numerous milk collection points/aggregation centres but only four functional Milk Collection Centre (MCC) that are equipped with cooling facilities.

Milk is usually collected from pastoralists in aluminium or plastic vessels and transported to milk aggregation centres using carts, bicycles, or motorbikes. Currently, none of the cooperatives are using mobile cooling units when collecting and transporting milk from pastoralists. Spoilage rates are estimated at around 20-30% in the rainy season and can reach 50% in the dry season.

Except for the four MCCs owned by FrieslandCampina, which is used to collect milk for FrieslandCampina's own processing activities, there are no other centres which have operational milk cooling tanks. Milk can be stored in cooling tanks for 12-14 hours before being processed.

In most cases, since there are no cooling facilities, agents from the processors or integrated dairy companies will typically send their own trucks to aggregation centres to purchase and quickly transport the milk back to their own cooling and processing facilities. These centres tend to be strategically located so that they are in close proximity of processing facilities. While less common, a few of the vertically integrated dairy companies also have buying agents who will collect directly from pastoralists.

In the modern dairy segment, the testing of milk is critical to ensure that processors receive good quality raw milk. Testing is conducted at the initial point of collection by the aggregators and again by the processors after they purchase milk from

aggregation centres. Milk is prone to adulteration and can be an ideal breeding ground for bacteria under unhygienic production, transportation, and storage conditions. This is exacerbated when these processes occur under ambient temperature. Platform tests such as an organoleptic evaluation, alcohol test, and lactometer tests are conducted by the aggregator before purchasing milk from pastoralists and commercial farms. The processor will also repeat the alcohol and lactometer test to ensure that the milk has not spoiled or been adulterated since being handled by the aggregator. Some processors may also conduct a clot on boiling test and Resazurin test to measure the acidity and microbial activity in the milk.

Prices offered to pastoralists are based purely on volumes and no premiums are paid for better quality or higher milk fat content. Whether or not pastoralists will receive more favourable prices from selling to the modern dairy segment depends on the season and their proximity to urban areas. For example, L&Z offers pastoralist producers a premium of N20 per litre for their milk, over and above the prevailing market price for fresh milk.

Processors will typically offer higher prices than traditional markets for fresh milk. However, since most pastoralists are selling fermented milk products and not raw milk, it is more appropriate to compare this price with the price of these traditional products. In the wet season when prices for traditional products are low, pastoralists will always get more income from selling to the formal sector. In the dry season, this will depend on their proximity to main markets in urban areas.

Pastoralists who are closer to urban areas may receive about the same or more income from selling Nono and Kindirmo. On the other hand, pastoralists in the villages will almost always get more income from

⁴⁷Abiodun, E. (27 Aug 2014). "Dairy Leads Nigerian Food Sector with N347bn Revenue." This Day Live.

selling fresh milk to modern processing facilities.

Processing

The majority of integrated dairy companies (7 of 12 companies) will supplement fresh milk with imported milk powder when processing dairy products. These companies mainly produce pasteurised milk and yoghurt. Nearly 90% of the integrated farms produce yoghurt, with the majority combining imported milk powder with fresh milk for yoghurt production. The amount of fresh milk inclusion varies by company and season and typically ranges from 10-50%. For example, L&Z tends to use only 20% raw milk in the dry season and up to 50% in the rainy season. Lamda Farms, on the other hand, has only recently started using imported milk.

This is to compensate for low milk production that has resulted from cattle rustling. As a result, it still predominantly uses fresh milk. Several companies, including Shonga, L&Z, Farm Fresh, and Milk Way also produce pasteurised milk, which is made for fresh milk.

Aside from integrated farms, there are also commercial processors which are only involved in the processing of dairy products and not in dairy farming. There are 8 large dairy processors, with FrieslandCampina as the market leader.

All of these processors are operating below capacity utilisation. FrieslandCampina is estimated to have a 30% revenue market share, which is nearly double that of its closest competitor.⁴⁷ It has the capacity to process 1.5 million litres per day but is currently only collecting 15,000 litres of fresh milk daily in the wet season and 6,000

litres per day in the dry season. While only FrieslandCampina and MILCOPAL are using fresh milk, all of the large processors are using imported milk powder. As noted above, FrieslandCampina sources fresh milk from pastoralists and Shonga Farms. MILCOPAL, which has been in operation since the 1970s, works with approximately 40 milk cooperatives in Kaduna. Initially, it only used fresh milk to produce yoghurt, but it now uses up to 50% imported milk powder in the dry season.

Other dominant firms include Promasidor Nigeria Ltd, CHI, Nestlé Nigeria Plc, and PZ Nutricima. The average output for the integrated farms ranges from 1,000-6,000 litres per day. In general, processing plants with a throughput of 1000-2000 litres per day require an investment of approximately \$100,000-200,000 dollars and have an expected profit margin of 40-50%.

Although fresh milk yoghurt is in high demand and is a strong potential growth market for dairy processors, few processors are producing this product since they face difficulties sourcing raw milk.



Table 2: Large dairy processors

Rank	Company	Location	Sources of milk supply		Main products and brands
			Pastoralists	Imported milk powder N	
1	FrieslandCampina	Lagos	Y	Y	Repackaged milk powder;reconstituted milk; UHT milk Brands: Peak, Three Crown
2	Promasidor Nigeria Ltd	Lagos	N	Y	Repackaged milk powder Brands: Cowbell, Loya
3	CHI	Lagos	N	Y	Yoghurt; reconstituted milk Brands: Hollandia
4	Nestlé Nigeria Plc	Lagos	N	Y	Repackaged milkpowder
5	PZ Nutricima	Lagos	N	Y	Repackaged milk powder Brands: Olympic Yoghurt
6	Saj Foods	Zaria	N	Y	Ice cream (mainly); drinking yoghurt
7	FAN	Ibadan	N	Y	Yoghurt
8	MILCOPAL	Kaduna			Repackaged milk powder, reconstituted milk
9	National Food Industries	Lagos			Brand : Luna



Similar to many of the large processors, most medium-scale processors and home-based processors use only importing milk powder and produce mainly yoghurt. Some medium processors are also producing fresh milk yoghurt or have recombination facilities where they use both fresh milk and imported powder. Medium processors are formal businesses registered with the National Agency for Food and Drug Administration and Control (NAFDAC). They tend to have a throughput of 500-1000 litres per day.

There are approximately 10 medium dairy processors in Kaduna and potentially 10 similar sized factories in each state. Unlike medium and large processors, home based processors are cottage industries which do not have structured factories and processing machinery.

Almost none of these home-based processors are registered. Although the exact number of small-scale processors are unknown, these cottage industries are present in almost all of the State capitals in the North. There could be as many as 50 in each of the major towns and urban areas. Very few of these processors are using fresh milk, and those who do will source between 30-100 litres of milk per day from

pastoralists in peri-urban areas.

Wholesaling and retailing

Distribution channels vary according on the size of the dairy companies, with larger companies more likely to sell through wholesalers or distributors. Integrated farms and large processors tend to sell branded dairy products and will usually have their own marketing teams and depots. They will use their own refrigerated vans or trucks to deliver the dairy products to depots within or across States. Distributors or wholesalers will then purchase the dairy products at these depots and sell onwards to modern retail outlets such as supermarkets, hotels, restaurants, and fast food joints. A few of the integrated dairy farms (including Farm Fresh, L&Z, Majestik, and Niyya) have their own retail outlets while some of the large commercial processors will have a retail shop on their factory premises. Medium processors also sell branded products but will usually supply these dairy products directly to large retail outlets.

Finally, cottage industries sell mainly to small shops or directly to consumers. Their products are typically sold in unbranded bottles since these businesses are not registered with NAFDAC.

3.3 Supporting functions

The table below provides a brief description of the main supporting functions in the Nigerian dairy market and also identifies the key actors involved in each of these functions. Further analysis of the weaknesses of some of these functions is provided in Section 4.2.

Supporting function	Description
Feeds & forages	In the last 2 years (2017-18) some local producers of napier producers and pastoralis cooperatives have emerged supplying seedlings and limited amount of pasture to pastoralists and other consumers. Currently some of these suppliers (NASRUN and Majestik) have over 40 hectares of planted napier on their farms There are at least 8 feed companies in Nigeria. These include Vital Feed in Jos; Feedmasters and Hybrid Feed in Kano; Albarka Feed, Global Link, and Savannah Feeds in Kano; and Animal Care and Livestock Feeds in Lagos. Most of these companies produce poultry feed and have only recently started producing ruminant feeds because of the Agricultural Transformation Agenda (ATA). However, these commercial ruminant feeds are not customized for dairy production. Only in the past year has several of these companies used the services of a dairy consultant to obtain knowledge on appropriate dairy feed formulations. These feed companies are interested in targeting small commercial farms since integrated dairy farms are able to compound their own feed at a cheaper cost. There are also numerous agro-industrial processors (such as cotton ginneries, rice and wheat milling factories, breweries, sugar processing factories, and other food and beverages
Breeding	There is currently no active AI service or breeding Centre that is run by the government. However, the Kaduna State government is trying to reactivate 4 breeding centres. Under the Dairy ATA, the government distributed 15,000 straws of semen to pastoralists and commercial farms from 2012-2014. This was fully subsidized by the government but success rates from AI were poor. Aside from government involvement in AI, there are approximately 7-8 private service providers who are importing semen straws to Nigeria.

Animal health/ veterinary

While there are more public veterinarians than private ones, there has been an increase in private veterinarians in recent years. These private practices are more active in service delivery. Neither the private nor public veterinary services have specialized knowledge in dairy production.

The Federal Livestock Department has also given approval for the training and certification of community animal health workers (CAHWs), which has allowed community volunteers to be trained under the guidance of private or publicly employed veterinarians. Other government institutions involved in animal health services include:

- State-level Department of Veterinary Services: responsible for the delivery of public veterinarian services;
- Veterinary Council of Nigeria: certifies public and private veterinarians;
- State-level Ministry of Agriculture: registers private veterinarians; and
- Local government: provides a veterinary doctor and para-veterinarian who are responsible for all types of livestock, along with reporting to the government.

In terms of veterinary drugs, there are many companies importing drugs or partnering with foreign companies to produce drugs. Approximately 80% of the drugs are imported. The major manufacturers in Nigeria include Animal Care Services, Pfizer, and Sam Pharmaceuticals. Most of these companies have large to medium scale distributors in all the major towns in the country. The wholesalers generally distribute to small-scale retailers, patent medicine dealers, private veterinarians, and para-veterinarians.

There is also a prevalence of fake and adulterated drugs available in the market. Finally, in terms of vaccines, the NVRI is responsible for the production of a wide range of vaccines. The Institute has been able to sustain the production and supply of quality vaccines for most of the epidemic diseases of livestock. Efforts are currently being made towards the production of a vaccine for FMD, which is among the most devastating diseases for milk yield and calf mortality.

Training & extension

There are significant knowledge gaps around local feed formulation, growing of nutritious pasture, herd health management, breeding management, and hygienic collection and storage of milk among pastoralists. The Agricultural Development Projects (ADPs) of the State Ministries of Agriculture are charged with provision of extension services. However, these services are for general livestock and are not specialised for dairy farming. They are rarely used by pastoralists, who mainly obtain information from other farmers.

The present government is trying to reactivate the extension service in the country, and this may play a more important role in the future in delivering better information to pastoralists.

Other sources of information and training for pastoralists are the National Commission for Nomadic Education (NCNE) and development programmes. The NCNE regularly provides a Training of Trainers twice a year, which reaches approximately 150 pastoralists per training. The training covers animal health and nutrition, milking and handling practices, and milk hygiene. Other dairy trainings have been provided through development or government programmes such as ATA, CADP, and 2SCALE. For example, 2SCALE worked with farmers to strengthen their technical capacity and improve milk volumes and quality. MILCOPAL also supports its cooperatives with training for the farmers and linkages to input sources.

Research and development (R&D)

Research and development (R&D)

There are several institutions in Nigeria and abroad conducting research in diverse areas of livestock production, including the production, processing, and marketing of dairy. All agricultural research institutes in Nigeria are coordinated by the Agricultural Research Council of Nigeria (ARCN). Important research institutes dealing with dairy in the country include:

- NAPRI in Kaduna, which is responsible for the improvement of all livestock nationwide, pasture and fodder seed development, and artificial insemination;
- NVRI in Plateau State, which is responsible for animal health and breed improvement, as well as vaccine production; and
- Nigerian Institute for Trypanosomiasis Research (NITR) in Kaduna, which studies and controls biting flies on both humans and animals.

	In addition, many of the Faculties of Agriculture, Faculties of Veterinary Medicine, and Faculties of Medicine in Nigerian Universities also carry out some dairy related research. There has been significant breakthroughs in animal health from NVRI. Recent achievements include developing a new vaccine for lumpy skin disease, which was previously imported. NAPRI has also come up with numerous livestock innovations, but these are mostly for other livestock or are only being used on integrated farms rather than at the pastoral level. For many of the research 23 institutes, R&D activities are thinly spread across all livestock species (cattle, sheep, goat, poultry, etc.), with limited resources for dairy development alone. Even when there are successful innovations that could benefit pastoral dairy farming systems, these innovations are not always disseminated or widely promoted.
Financial	Most pastoralists self-finance the production of crops and livestock. Since livestock are inherited, there is no need for capital outlays for the acquisition of cows. Pastoralist systems tend to be low input-low output. Feed and water mainly come from free grazing on pasturelands, and the only items that need to be purchased are drugs and vaccines. At the same time, women and girls freely hawk the fermented milk products, which requires no additional investments in marketing. In short, finance is generally not available for pastoralists serving the traditional markets but is also unnecessary given their current practices. Pastoralists who supply the modern dairy segment through cooperatives will often be able to access cooperative loans. For commercial farms, the need for financing varies by farm. Some of these farmers are self-financed while others will seek loans. For large processors and integrated farms, there has been increasing interest and willingness by foreign investors to invest in dairy production in Nigeria (e.g. FrieslandCampina, Shonga Farms, and L&Z). Aside from direct foreign investments or partnerships between Nigerian enterprises and foreign investors, there are some commercial banks which provide agricultural loans. The government has also been promoting agricultural credit schemes through the Bank of Agriculture, the Bank of Industry, the Cooperative Banks, and the Commercial Banks. While these schemes are aimed at stimulating private sector led investments in agricultural production, processing, marketing, and input supply, limited finance has been disbursed through these schemes.

Cooperative development	The majority of existing cooperatives have been formed with the support of the National Livestock Project Department (NLPD) and State Agricultural Ministry. A number of them have also been formed by donor projects. For example, the World Bank-funded Commercial Agriculture Development Project (CADP) has supported the registration of a number of dairy cooperatives in Kano and Kaduna. They have collaborated with NLPD to support the formation of cooperatives for L&Z and are also trying to create new cooperatives and reactivate several other cooperatives in Kaduna (including in the Kachia, Gayan, and Damau grazing reserves). MILCOPAL in Kaduna has also formed and registered 40 cooperatives. The International Fertilizer Development Centre's (IFDC) 2SCALE programme has assisted FrieslandCampina with organising farmers into cooperatives. These cooperatives are considered to be the most organised, sustainable milk cooperatives in the country.
Cold chain	There are currently no public or private enterprises providing cold chain transportation services for the dairy sector, and small-scale mobile cold chain technologies have yet to be introduced in the Nigerian dairy sector. Since most fresh milk and modern dairy products are highly perishable, an efficient system of collection, transportation, and storage with cold chains is necessary to maintain the quality of both raw materials and end-products. Currently, those who are engaged in the collection, transportation, and bulking of milk from pastoralists will not use mobile cooling units and will rarely have access to cooling tanks. Integrated farms and large dairy processors tend to have their own refrigerated vehicles and cooling tanks that they use when sourcing raw milk and distributing finished dairy products.

3.4 Rules

Within the last two decades, various policies have been put into place to support the development of the dairy sector in Nigeria. This includes policies and soft loans to support the establishment of more viable commercial farms and processing plants, particularly around the major cities of Kaduna, Kano, Zaria, and FCT Abuja. There was also a 2008 Presidential Committee on Dairy which focused mainly on commercial dairy development and was chaired by one of the commercial farms.

Dairy was one of the main sectors under the previous government's Agricultural Transformation Agenda and plans were made under this agenda to boost pastoralist production. There is now a Presidential Committee on Grazing Reserves and Cattle Stock Routes, and other measures are also being pursued to improve conditions among pastoralist communities. In addition to these formal rules, there are informal rules around the way the Fulani rear, hold, and dispose of cattle, which may affect the pace of change among pastoralists.

The table below provides a brief description of the main formal and informal rules affecting the Nigerian dairy market. Gender and conflict dynamics are not discussed in this table as they will be covered in Section 0 on Cross-cutting Issues

Rules	Description
Dairy ATA	The Dairy ATA is part of the wider agricultural transformation agenda initiated by the former President in 2011. The Dairy Transformation Plan aimed to increase dairy production to 1.1 million MT per year by 2015 and to increase the income of pastoralist households by at least US\$ 285 million. In order to achieve these goals, this would require improving yields from less than 0.69 litres per cow per day to 2 litres and above. Measures under the plan included organising pastoralists into milk cooperatives in 17 states; linking clusters of sedentary and semi-sedentary pastoralists to dairy processors, input suppliers, and animal health and extension services; dairy social marketing to promote consumption of locally produced fresh milk and the benefits of milk consumption; and the establishment of full-service milk collection centres. None of the planned milk collection centres have been established but the government has partially subsidised feed and drugs and fully subsidised AI under the Dairy ATA. Tariffs were also reduced for companies importing dairy equipment. There are currently no active activities under the ATA.

Grazing rights	The Grazing Reserves Law of 1965 provided for the establishment and management of grazing reserves and was an attempt to support nomadic pastoralists to transition towards a sedentary lifestyle. However, only 90 of the 414 earmarked grazing reserves have been gazetted and only a handful have been developed and are operational. This has resulted in the encroachment of lands designated for grazing by other land uses (local farms, commercial farms, infrastructure, etc.). There is also a 1988 policy which requires that states acquire, gazette, and protect 10% of land for pastoralists. Currently, a bill on creating a National Grazing Reserve Establishment and Development Commission is under review in the National Assembly. The new commission would be responsible for working with states to review existing grazing reserves, determine priorities for the establishment of new reserves, and provide infrastructure and services to all reserves.⁴⁸ The Presidential Committee on Grazing Reserves and Cattle Stock Route has also in its last communique with the President supported the development of a new agency to address the conflict between pastoralists and farmers and recover grazing reserves and cattle routes.
Cooperative registration	Every state has a Department of Cooperatives that promotes and supports the formation and registration of cooperative societies. This department works hand in hand with the ADPs and the field extension agents of the ADPs. When a group of local producers forms a cooperative society, they need to apply for registration to the Department of Cooperatives. This is often supported or led by the local extension worker. Certificates of registration is then offered to the group which can be used to access cooperative loans and other support services provided by the ADPs and other supporting institutions.
Quality standards	Quality assurance and standards in the dairy sector mainly involve three institutions: Federal Livestock Department, NAFDAC, and the Standards Organization of Nigeria (SON). NAFDAC and SON share the responsibility for regulating food products, which includes protecting consumers from fraudulent or unhealthy food products. Both imported and domestically produced products are supposed to be registered and certified by NAFDAC.

⁴⁸ Mercy Corps (2015). Nigeria Household Costs of Conflict Policy Brief July 2015.

	SON has put in place a Mandatory Conformity Assessment Programme (MANCAP) which ensures that locally manufactured products comply with the Nigerian Industrial Standards (NIS) prior to sales in local or export markets. While there are more than 20 local milk brands available, only few have gone through SON's rigorous certification process and met the NIS quality requirements. There are also hundreds of unregulated and uncertified unbranded dairy products in the market.
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Import bans & tariffs	In 2012, the government wanted to ban imported milk powder in order to stimulate local dairy production in Nigeria. In the end, the ban was not implemented as commercial processors and integrated dairy companies argued that measures need to be first taken to build the capacity for increased local production. This has prompted companies like FrieslandCampina to start sourcing fresh milk from domestic farms and pastoralists. There are currently some tariffs on powdered milk, and the government is interested in increasing the tariff on imported milk powder over time and is gradually working towards banning imported milk powder. There are also high tariffs on finished dairy products but this has mainly impacted consumers through higher prices. While there are import restrictions on dairy products, there is currently no national breeding policy that limits or controls the imports of semen or livestock.

Advocacy	There are several groups which are lobbying for more favorable policies for pastoralists. Miyetti Allah Cattle Breeders Association of Nigeria (MACBAN) is the main Fulani tribal association. However, the association is highly fragmented, which makes it difficult for the Fulani to speak with one voice.
Informal pastoral traditions& norms	There are informal rules around the way cattle are reared, held, and disposed of by the Fulani. Some of these traditions and norms, particularly around breed improvement, feeding practices, and milking practices, can inhibit investments in improved productivity by the Fulani. - Ownership: The Fulani tradition favours men owning cattle rather than women or children. - Breeding: It is expected that each herdsman will maintain the genetic thread of the family herd. As a result, introducing other breeds into the family herd is often frowned on and viewed as a dereliction of one's cultural and family duties. This explains why most of the pastoral families are averse to exotic species, which unlike indigenous species have no horns or humps. In fact, many pastoral families will pride themselves on the length of the horns and the size of the humps of their cows. - Rearing practices: Mobility is often seen not only as a means of sourcing feed and water but also as a cultural practice that cements social ties across broad geographical regions and provides livestock variable environmental conditions that favour breeding and reproduction. Thus, many pastoral families dislike maintaining herds within limited areas or geographic spaces, in particular defined enclosures or cages, and are resistant to semi-intensive or zero-grazing production systems. Most families view the western systems of livestock production as a negation of the spiritual being of the animals. - Milking practices: According to milking best practices, the calf should be separated from the mother and fed with collected milk. This, however, goes against Fulani traditions where Fulanis believe that calves have the right to their mother's milk and should be allowed to suckle milk. - Cattle sales: There are norms restricting the sale of animals. Generally, cattle are only sold to meet pressing family needs and therefore, offtake rates are very low.

Cultural norms regulate which animals to sell, prioritising matured bulls followed by female cows that have completed their reproductive cycle. Heifers, young bulls, or reproductive cows are rarely sold off.

3.5 Cross-cutting issues

The table below provides a summary of key gender, conflict/political economy, and environmental considerations influencing the Nigerian dairy market.

Intervention in this market is expected to have significant benefits for women. While most

Women in pastoral societies do not own and manage cattle, women are almost exclusively the owners and managers of milk and other dairy products.

They have control over milk processing and marketing, as well as the income from the sale of milk and other dairy products. Women make decisions on how much of the milk is to be consumed by the family and how much is to be sold. They also decide the types of products to process and where to market the products. Finally, they decide how to use the proceeds derived from dairy marketing.

Additional details regarding the marketing of milk and the control of milk proceed is provided below:

- **Milk marketing:** The marketing of dairy products is not only about hawking milk but is also a means of socialization among pastoral women. When women go to the market, they are able to learn and share information, skills, and practices. The downside of milk marketing is that it is often performed by Fulani girls who are taken out of school to hawk the household's dairy products. Bulk purchasing of milk by processors can be a means by which to free up these girls to attend school. At least one processor, L&Z has piloted a scheme which provides incentives to pastoral households to keep their female children in school.

- **Milk income:** Although some women may willingly give some of the proceeds to their husbands to address some family needs, it is generally a taboo among pastoral societies for men to request that women give them the dairy proceeds. In fact, in many communities, there are community institutions that prevent men from collecting money obtained from the sale of milk and dairy products. Since women control the income from milk and this income is usually used to cater to the needs of the household (especially that of women and children), higher volumes of milk production is intrinsically linked with better livelihoods for women in pastoralist households.

Conflict and political economy considerations

The main threats to dairy farming are cattle rustling and conflicts between pastoralists and farmers. These have negatively impacted on productivity and herd size. As noted in Section 2.2, the insurgency in Yobe, Borno, and parts of Adamawa States has also resulted in a migration of cattle and milk producers, primarily to neighboring countries.

- Cattle rustling: Fulani leaders have appealed to the new administration to give priority to tackling the incessant cattle rustling. Cattle rustling is carried out by criminal networks, which involve a number of different ethnic groups working together. The rustling of cattle is conducted for economic gains, with rustled cattle sold to beef markets in the South. These operations require significant planning, coordination, and linkages in order to move and market the cattle. As noted in Section 2.2, cattle rustling is concentrated in a number of States, with the highest incidences in the southern parts of Zamfara, western parts of Kaduna, and northern parts of Niger States.

- Violent conflict between pastoralists and farmers: These conflicts are largely centred on the competition for common resource use (e.g. use of grazing areas, farmland, stock routes, and water points for animals and households). This is driven in part by desertification, climate change, population growth, alongside a lack of clarity around the demarcation of grazing areas and stock routes. These conflicts have led to the loss of lives, property, and livestock and have negatively affected livestock productivity, including milk production. According to a 2013 Mercy Corps Study in Kaduna and Nasawara, loss of household income from these conflicts results in up to a 2.9% loss in potential GDP for these States, and the average household affected by such conflicts would experience at least a 64% increase in income in the absence of farmer-pastoral conflicts.⁴⁹

In terms of the political economy, it is expected that the policy direction will become more favourable towards pastoralists under the current president who has passion for livestock rearing and owns a Livestock farm. Measures are already being put in place to curb the problem of cattle rustling. In July 2015, the new government ordered a military led onslaught against the cattle rustlers. Proposals have also been given to the President around addressing the problems associated with grazing reserves.

Environmental considerations

- Impacts of the dairy sector on the environment: Open grazing can have large ecological impacts, especially where overgrazing occurs. It can result in land degradation (including soil erosion and deforestation), as well as surface water contamination. Livestock production is also known to result in increased carbon emission, thereby contributing to global warming.
- Impacts of the environment on the dairy sector: Dairy and cattle farming is also heavily influenced by climate change and desertification. This influences the availability of feed and water, which are becoming scarcer.
- Opportunities to mitigate or improve the environment through the dairy sector: The large amounts of manure produced by cattle can be an important source of organic fertiliser, which could reduce the use of chemical fertilisers.

Constraints Analysis

4. Constraints analysis

4.1 Significant constraints and underlying causes

Low productivity of, and low price for milk are the two major constraints to income growth of pastoralist in Nigeria. These constraints centers around weak knowledge of milk production and handling best practice and lack of access to required supporting functions. Addressing these constraints presents significant sector and enterprise growth opportunities.

The constraints are:

Constraint 1: Low Productivity

Low quantity and quality of feed :

Pastoralist milk production is 0.69 litres per cow per day on average which is mainly due to the inadequate quantity and poor quality of feed available all year round. The pastoralist's dependency on rain-fed forage and pasture production results in low quantity and quality of feeds especially forage during the 7month of dry season in Nigeria. Other factors contributing to the low quantity of feed include unfavorable climatic factors, conflicting use of arable land between crop farmers and pastoralists, more Fadama areas being put under cultivation and the shrinking of the grazing reserves leading to overgrazing and seasonal availability of pasture. Apart from seasonality, the quality of our tropical

pasture has been known to be low in protein and high lignin content resulting into low digestibility coefficient of these pastures. Consequently, animals being fed this grass have poor nutrition and low milk harvest.

This situation is further made worse by the Pastoralist's poor knowledge and adoption of processing and conservation of animal feeds to smoothen seasonal fluctuations in milk production and their limited capacity to utilize and enhance the abundance crop residues available post-harvest during the dry season.

Also, the little feeds available during the dry season are sold at high cost which more often the pastoralist cannot afford to buy. Additionally, alternative feeds in the form of agro-industrial by products are generally expensive and short in supply. The high cost and inadequate agro-industrial feeds and concentrates further serve as constraints in accessing adequate feeds for dairy cows.

Feed formulation also is a problem because there are only a few feed millers (such as Animal Care and Feed masters) involved in production of livestock feed in the country. These millers are new entrants into this sub-sector and therefore have limited knowledge of producing balanced dairy concentrate feed at an affordable cost due to Lack of support by Government and private sectors in funding researches as well as non utilization of available information from our Universities and other Institutes of higher learning. The seasonality and high

⁴⁹ Mercy Corps (2015). Nigeria Household Costs of Conflict Policy Brief July 2015.

cost of inputs for this kind of feed in the country as well as low purchasing power of the pastoralist have forced feed millers to produce low quality feeds if they are to remain sustainable.

Poor Quality Breeds (Genetics):

One of the major root cause for the underperformance in milk production is the fact that the local breeds (mostly Bunaji and Gudali) whilst genetically good for beef are poor milk production yielding an average of 0.69 liters per day per cow. Again genetic improvement of the local variety has remained unchanged over the years as pastoralists largely rely on natural cross-breeding with very few farmers adopting modern techniques such as Artificial Insemination (AI) due to cultural resistance, lack of technical expertise as well as high costs of artificial insemination, and crossbred bulls. Apart from this, farmers often practice inbreeding resulting into continuous propagation of breed with low milk genetics because there is low understanding of artificial insemination and crossbreeding to produce varieties with higher milk yields among the pastoralists.

Limited knowledge of dairy production practices:

Productivity of smallholder dairy farmers has been low because the available extension service delivery is centered on general livestock management and so extension service agents lack knowledge of modern dairy farm management practices. Again, extension services provided through the Government unified agriculture extension service (UAES) has not been adequate and efficient in reaching out to the pastoral producers.

This is compounded by the acute inadequacy of extension workers in the country, with a ratio of one extension worker to ten thousand farmers (1:10,000)

and so pastoralists lack access to good information on Livestock practices to adopt. Reduction in government funding of research institutions impacted adversely on the benefits that accrues from innovation developed through research.

Even where such research have resulted in new knowledge and discoveries there is poor and limited dissemination to end users resulting in outcomes of genetic improvement from institutions like ARCN, NAPRI and NVRI not being applied. This is also worsened by the fact that majority of the pastoralist are illiterate and nomadic.

Furthermore, the weakness of animal health care services have resulted in the preponderance of livestock diseases which are affecting productivity, especially contagious diseases like foot and mouth disease (FMD) that lowers milk yield and leads to abortion and death of calves.

There is also very little private sector involvement in animal health care service especially in the rural areas. These set of extension workers are mainly driven by commercial consideration and tend to be more knowledgeable and current in modern practices and therefore are a bit expensive for smallholder farmers to patronize.

Thus they are currently focusing in serving large and medium size modern dairy farms who are able to afford their services.

Constraint 2: Low Price Per Litre

Poor storage facilities and lack of access to cold chain services:

Fresh Milk as a perishable commodity must be sold for processing within two to three hours of milking unless there are efficient preservation and storage facilities that will preserve the milk in its natural form for longer periods. This lack of adequate storage and preservation facilities reduces the ability of pastoralist to build up volume

to meet up with the throughput of processors thus resulting in high frequency of sale, low bargaining power and low prices from the processors. The resultant low bargaining power has a downward impact on price, particularly when the milk is sold in fermented state as yoghurt (Kindirmo and Nono) in the informal local market.

Other related factors include lack of knowledge on primary milk handling and processing, lack of good access roads, access to functional dairy infrastructure such as specialized vehicles and access to cold chain facilities and services. There are very limited number of functional milk collection centres (MCC) and cold chain facilities in the country. The exception is Fashola Ranch that provides such services to few producers in Oyo State. There are a few public MCC in some grazing reserves

like Runka (Katsina State), Gidan Jaja (Zamfara State), Wase (Plateau State) and Udubo (Bauchi State) which currently are not functional, making milk off-take by processors very difficult.

4.2 Root causes

There are a number of supporting and enabling functions that are affected by the underlying causes of the highlighted constraints. In order to strengthen the market system, it is crucial that weaknesses in these related functions are the target of BIF dairy interventions.

The related supporting and enabling functions and their key weaknesses are summarized and discussed in more detail in the Intervention Logic Table below.

Table 3: The Intervention Logic Table

Constraints	Underlying Causes	Related supporting & enabling functions		
Farmers have low milk productivity	a. Farmers have to make do with low quantity and quality of feed because of overgrazing on the limited pasture lands due to more expanding cropping activities and urbanization and seasonality of pasture and type available. In addition, there are no known commercial pasture producers and only few companies producing concentrates for ruminant livestock, with none specifically formulated for dairy cows.	Feed	Low quantity and quality of feed Naturally grasses (pasture) are the major source of feeds for pastoralists, where pastoralists take their cows to freely graze. With expanding cultivations and urbanization, grazing areas are increasingly becoming inadequate causing acute feeds scarcity, overgrazing and degradation of grazing areas. In addition, the seasonality of pasture in grazing areas creates scarcity of feeds, thus making all year availability of feed practically impossible. In view of this, the quality of feed derived during the dry season is very poor.	Intervention 1: Improving availability of forage by promoting commercial production and use of Napier grass -Increase value addition through Napier grass processing. -Improve access to feed through TSP/agripreneurs

			Also apart from seasonality, the quality of tropical pasture is low due to high lignin content resulting into low digestibility coefficient. The farmers also have poor knowledge of Value addition of feed through conservation into silages, pellets and crop residue enhancement. Furthermore, the little feeds available during the dry season are often sold at high cost, which the pastoralist cannot afford.	
	c. Farmers have limited knowledge of good dairy production practices in the areas of milk & milk hygiene, herd health management, breed improvement protocols and feed & feeding of dairy cattle	Extension services training	The initial extension service delivery was primarily centred on general livestock management and so capacity of these agents was not specifically built on modern dairy farm management practices and provision of breed improvement services (inseminations). Another factor that plays a significant role is the resistance to adoption of improved genetics due to pastoralists' cultural practices of not wanting to dilute their cattle gene besides the challenge posed by inadequate inseminators and high cost of exotic breeds and their semen for Artificial Insemination. One other reason is that in the recent years within the country, public extension service deliveries especially in the aspect of livestock	Intervention 2: Improving access to modern dairy farm management practices through better extension services.

			has declined and become moribund (at an extension worker to farmer ratio of 1:10,000), thus creating a huge gap in delivering most of the dairy research findings from our institutions / universities to pastoralists. There are very few private sector service providers who are in turn mostly limited to the provision of veterinary services. Additionally, the low level of education and literacy among the pastoralists has limited their capacity to demand for, and access information on good dairy practices.	
Farmers get a low price per litre of milk	Farmers have poor Storage facilities and lack access to cold chain services. The low price that farmers get for their milk is due to its high spoilage rate (perishable) post milking if not properly handled and preserved on time. Poor Value addition: - farmers are price takers due to perishable nature of milk and lack of access to cold storage facilities in remote locations and lack of knowledge on value addition.	Milk Collection centres and cold chain facilities Rural milk processing facilities	The traditional storage practices are usually associated with high risk of spoilage and so accessibility of farmers to processors that need this milk is limited because of inability of the farmers to build up sufficient volumes to meet the throughput of the processors. Also the lack of cold chain facilities for storage and lack of knowledge of value addition. The limited number of channels to markets means that milk is either sold to the buyers who set a low price, or converted into sour milk where it can end up being wasted. In addition, there is limited ability for pastoralist to add value to their produce. With facilities	Intervention 2 Improve milk hygiene and pasteurization techniques Intervention 4 Rural milk processing business model.

			for processing milk not present in pastoralist communities which significantly reduce the potential income for pastoralist, especially for women who typically control the milk economy for domestic purposes.	
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Market Strategy

Changing government policy in favour of Nigerian dairy companies increasing local sourcing as well as increasing awareness and appetite for milk and milk products among Nigeria's growing middle class has created a number of market growth opportunities for pastoralists to increase their supply of milk to processors thereby increasing their productivity and income. BIF Nigeria's vision for the dairy market is therefore aimed at enhancing pastoralist livelihoods and income generation through increasing the production of higher-value milk so that they can participate and benefit from the increasing utilisation of milk in the formal markets.

This can be achieved through the adoption of improved animal husbandry management practices and the creation of

premium marketing channels to sell their products to milk processors and other end users.

Opportunities for BIF are integrated interventions in dairy production focusing on market access, knowledge application, access to viable and sustainable feeds (pastures) / water, good breed selection and proper knowledge on handling /storage options through milk collection improved pasteurization and or rural processing services.

The implementation of interventions in these areas could improve linkages between pastoralists and milk processors, which can go a long way in increasing the disposable income of pastoralists.

5.1 Proposed Opening portfolio of interventions

Intervention 1: Improving year round availability of forage by promoting commercial production of forage

Market underperformance: Feeds which account for about 60% of inputs in milk production play a vital role in raising productivity levels and supporting animal population increases, hence any scarcity of this component has a significant impact on milk production. However, the pastoralists have great difficulties in obtaining the required quantity and quality of feeds they need for their animals at affordable prices especially during 7-month dry season, thereby creating poor livestock feeding regimen, resulting in poor productivity with resultant low milk production or complete cessation of milk (0 – 0.5 litres per cow per day).

Furthermore, overgrazing and pastoralists' poor knowledge and adoption of conservation of animal feeds to smoothen seasonal fluctuations in milk production have further compounded the scarcity of feeds.

In our field study we found that market actors are aware of this problem and are trying in their own ways to overcome them. Lamda Farms Limited for example, in addition to producing pasture for its own animals is also producing and supplying forage from their farm to Pastoralists who sell them raw milk but only during the rainy season.

The same farm however is unable to meet its own needs during the dry season due to scarcity. The challenge for market actors remains how to scale up production of forage, how to store any over production during the rains against the dry season and how to do this affordably.

Vision of change: The envisioned change is provision of affordable pastures(Napier) and seedlings as well as processed Napier into silages and pellets by commercial pasture producers, to increase the availability of forage all year round for pastoralists resulting in increased milk production.

Overview of intervention: BIF aims to demonstrate the viability of commercial feed producers expanding their service offering to pastoralists to include forage production. The value proposition for the service includes additional streams of income but more importantly, it deepens relationship between pastoralists that already supply milk and both commercial feed producers and milk processors. The resultant increase in productivity amongst the pastoralists will significantly impact income levels.

There are two parallel intervention models under consideration;

- i) Commercial farm pasture production expansion to bridge the dry season gap for pastoralist with introduction of Napier grass - This model is being practised in Damau grazing reserves close to Pambegua in Kaduna State where a commercial pasture plot was established by the government through National Livestock Project Department. Kaduna. The Project is using an improved version of Gamba, a local grass which is produced, baled, stored and sold to pastoralist and other livestock farms at the peak of dry season.
- ii) Encourage establishment of mini pasture fields using Napier grass close to pastoralists homestead. This practice has already gained ground in small-scale dairy farming in Kenya where a certain part of their land has been set aside for and planted with Napier grass. The manure from the cattle is normally taken to the pasture fields since it is located close to their homesteads where the cattle are reared on zero grazing. At maturity, the Napier is cut and fed to cattle regularly because of its ability to re-grow quite fast after every cut.

Typical Activities for this intervention include:

- Identification of 3 commercial pasture producers and livestock farmer cooperatives in targeted areas.
- Presentation of the value proposition to the identified producers and farmer's cooperatives.
- Selection of at least one pilot commercial farm partner and 20 - 30 co-operative farmers per site in each of the targeted states.

- Provision of TA including a clear business case and model to a dairy farm for commercial pasture production
- Encouragement of the adoption of zero grazing or semi intensive grazing only for Lactating and pregnant cows
- Provision of technical assistance to support the creation and expansion of pastures fields with special emphasis on Napier grass for the pastoralists within their homestead.
- Facilitation of improved and mutually beneficial relationship between the Pastoralists buying the pasture and commercial pasture producers/farmer cooperatives.

Potential benefits include:

- A number of commercial dairy farms and farmers cooperatives adopting the commercial pasture production on a sustainable basis;
- Increasing use/implementation of an improved and well defined strategic business plan by private sector commercial pasture producers;
- Pastoralists and Farmers cooperatives adopting the homestead establishment of pasture will have all year round forage for their lactating and pregnant cows by the second year of intervention.
- Increased acreage under pasture and fodder.
- Enhanced milk yields by an average of 50-70%. Increase in pregnancy rate, a reduction in calving intervals and increase in calf crop and herd health are also potentially possible
- Farmers could have sustained milk production even during the dry season when yield reduces from 0.5 litres per day to complete cessation in some cases.
- There could be reduction in nutritional stress on these categories of animals.

Market underperformance: Sustainable animal breeding programmes through genetic improvement are a major requirement for increasing productivity of dairy cattle and thus income of pastoralist dairy farmers. It is therefore important that dairy cow breeds used by pastoralists for milk production are genetically suitable. In Nigeria, the dairy cows' breeds are more genetically suitable for beef, rather than milk production, resulting in low yields per cow. Compounding this adverse impact on productivity is the Fulani tradition that frowns on artificial insemination, which has resulted in very little or no genetic improvement of these local breeds. Combined with heavy reliance on natural breeding, liters-per-cow are very low.

Our fieldwork has demonstrated that most of the modern dairy farms in the country such as L&Z, Majestic and Lamda farms have adopted AI in breeding their animals with some reasonable degree (20-40%) of success. However, experiences have shown that exotic cow pure breeds are less adapted to Nigerian environment as they are prone to diseases and environmental stress⁵⁰. Again, such schemes have not focused their activities on the pastoralists who own the largest number of animals in the country. Recently there has been limited creation of awareness on the part of pastoralists on the need to improve the breeds of their through modern techniques and methods. A good example can be found in Ladduga grazing reserve in Kachia local government of Kaduna State.

Vision of change: the vision is to enhance milk production by enhancing and improving the dairy genetics of our local breeds of cattle.

Overview of intervention: BIF proposes to work with National Veterinary Research Institute (NVRI) and National Animal Production Research Institute (NAPRI) in commercial production of F1 semen with 50% dairy genetics that will be sold to AI Service providers and farmers cooperatives who will then inseminate some selected cows and heifers of pastoralists. In addition, the intervention will build the capacity of pastoralist to select good breeding bulls within their stock or outside through progeny mapping of the bull's sister or dam (female cow) in the aspect of her milk production records.

A commercial AI service provider has been identified as potential partner for a pilot intervention that will focus on scaling up its current service offering to include the pastoralists. NASRUN Nigeria Ltd is located in Kaduna has been providing AI services to mostly to dairy farms in the North of Nigeria, it has also been involved in community livestock upgrading in an intervention sponsored by Fadama and African development Bank. BIF proposes to engage with this company to jointly design a sustainable, commercial business model that will enable pastoralist to access its services affordably. In addition, BIF proposes to engage with the following institutions to ensure seamless supply of genetic materials to the identified company;

⁵¹ O A Ndambi, T Hemme and U Latacz-Lohmann: Dairying in Africa - Status and recent developments; <http://www.lrrd.org/lrrd19/8/ndam19111.htm>

- i) National Veterinary Research institute (NVRI Vom)
- ii) National Animal Production Research Institute (NVRI) Shika Zaria.

Typical activities for this intervention include:

- Conduct baseline study on breed improvement to establish and revalidate Pastoralist's needs in the area of breed improvement
- Embark on aggressive advocacy and promotion of herd recording by the pastoralists in partnership with the Nigerian Federal Livestock Department and relevant authorities
- Interface with the selected co-operative groups, discuss and explain the intervention models to be adopted to their satisfaction
- Design and sign an MoU detailing a commercial business model for production and distribution of semen with NVRI, NAPRI and NASRUN.
- Technical assistance to build capacity of pastoralist to select appropriate cattle and heifers (body condition score above 3) within the pastoralist stock that will be involved in breeding program.
- Tagging of animals to be involved in this program for ease of monitoring
- Interacting with the pastoralist to assist in identifying breeding bulls with good genetic potential on dairy by asking questions on the genetic line of these bulls.

Potential benefits include:

- An expanded opportunity for pastoralists to improve the dairy genetics of their offspring with 25% dairy genetics via artificial insemination.
- Enhancing the milk production of the local cattle through natural breeding with selected bulls.
- Increased productivity derived from these offspring over longer periods.
- Gradual improvement of pastoralist cattle breeds over time with associated increases in milk yields per Cow.

Market underperformance: Extension services are important in providing information and guidance to pastoralists. However, in Nigeria, the extension service delivery is weak and it is mostly provided by the public sector, mainly by the Agricultural Development Projects (ADPs), unified agricultural extension workers (UAES) or staff of the State Departments of Veterinary and livestock Services. There are very few private sector extension service providers who are mostly limited to the provision of veterinary services to pastoralists and commercial farms. Nevertheless, Farms like Lamda, Rauda and L&Z make available their private extension service providers to those pastoralists that are supplying them milk in case of any outbreak of a major disease.

As a result of weak extension services and their inability to pay for private extension services, pastoralists rely mainly on quacks and each other and adopt traditional practices in cattle management. They have limited knowledge of best practices in the areas of milk production, milk collection hygiene, herd health management protocol and feed & feeding of dairy cattle. Even in areas where limited extension services are provided, it is primarily centered on general livestock management. Additionally, the extension agents lack capacity on modern dairy farm management practices. The weak dairy extension services created a huge gap in delivering most of the dairy research findings by research institutions and universities.

Vision of change: The envisioned change is the provision of affordable and robust dairy extension services by Private extension service providers, especially Paravets/agripreneurs, to pastoralists that will enable access to, and adoption of milk production and handling best practices. This will result in increased adoption of milk production best practices, and an increase in milk yield per cow. This will enable pastoralists to increase their income and contribute more to increased supply of milk and other dairy products.

Overview of intervention: BIF aims to support providers of dairy best practices extension packages to provide technical assistance for the training of quality extension personnel for extension service providers. The intervention will strengthen linkages and align incentives between pastoralists and service providers. In addition, support the creation of private extension services providers drawn from the pastoralist communities and linking them to community animal health workers (Paravets) that will provide advance level support to the extension service providers.

BIF will provide TA for development of standardized dairy extension packages that will be simplified, and used for training of the agripreneurs. The agripreneurs will also be trained as trainers enabling more pastoralists to learn and adopt the practices. Development of an incentive system to ensure the spread of such good practices is self-propagating and could be supported through TA from BIF. This will involve collaboration and partnership with Pastoralist organization like Pastoral resolve(PARE),the Kano dairy and livestock union(Kadalhu)

¹ O A Ndambi, T Hemme and U Latacz-Lohmann: Dairying in Africa - Status and recent developments; <http://www.lrrd.org/lrrd19/8/ndam19111.htm>

Through BIF TA, the National Agricultural Extension Research and Liaison Services (NAERLS) responsible for production of extension materials for the agricultural sector, will develop the content of the extension service package(s), inclusive of a model for making the Train-the-Trainer approach self-propagating within the Pastoralist communities.

State Ministries of Agriculture will be encouraged by BIF to increase stakeholder participation in improvement of practices through sensitisation and mobilisation of communities using appropriate institutions like the traditional leaders.

Typical activities for the Intervention include:

- Mapping and identification of beneficiary pastoralist in target areas through comprehensive dairy survey
- Institutional linkages and building of partnership between pastoralist communities and relevant extension service providers.
- Support the development of dairy extension service content addressing best dairy practices.
- Support the development of training materials for extension service providers as well as for the training of community based animal health extension workers and agric entrepreneurship.
- TA for establishing a self-propagating Train-the-Trainer approach within the Pastoralist communities through major pastoralist organizations eg PARE & Kadalhu.
- Linkages with private service providers of extension services (Nasrun) to develop sustainable and affordable provision of services to pastoralist groups

Potential benefits include:

- Increased access to information by pastoralists for better management of dairy herds.
- Increased use of modern and improved methods of animal production addressing the wastages associated with adoption of traditional practices.

Market Underperformance: Fresh milk and most other dairy products have a short shelf life within which the products have to be used or handled through an efficient and effective means of milk collection, distribution and preservation. Opportunities therefore abound for the running of milk collection centres (MCCs) along with the provision of cold chain services and cottage yoghurt production. However, with most of the pastoralists located in remote rural areas, they are faced with a number of logistical problems such as lack of good access roads, specialised vehicles and functional cold chain systems. These challenges result in inefficient methods of collection and distribution of milk resulting not only in high spoilage rates, especially in the wet season, but low prices for their milk.

There have been several attempts at establishing MCCs in Nigeria with different degrees of success. For instance MiLCOPAL set up MCCs in Kaduna and Abuja with dismal results attributable to low prices offered to pastoralists which in turn resulted in unsustainably low volumes of milk aggregation and collection by the MCCs. On the other hand WAMCo has successfully set up an MCC in Fashola Oyo state with better facilities and a competitive pricing system that has recorded yearly growth of milk volumes delivered to the centre. The success of the Fashola model may also be due to the direct relationship between pastoralists and a processor who is able to offer higher prices and the provision of a certain level of embedded services (enhancing value) directly to the pastoralists.

During our field studies we also encountered a joint venture between a Nigerian and French processor that is seeking to establish MCCs in Northern Nigeria to bring in milk from pastoralists in Kano, Kaduna, Katsina and Sokoto States, with Lamda Farms strategically positioned as possible operator of the MCCs.

The joint venture company is driven by fear that a ban on importation and/or a restriction of access to foreign exchange for importers of milk powder into Nigeria is imminent and the need to improve its local sourcing to reduce its production risks. They believe either of, and certainly both negative scenarios pose an existential threat to their company. This demonstrates the increasing importance and urgency market actors are starting to place on overcoming this market underperformance. The pre-occupation they seem to have is around how to establish networks of MCCs that would be both sustainable and scalable.

Vision of Change: The envisioned change is increased number of commercially viable milk collection centres and efficient cold chain services managed by key stakeholders such as cooperative societies and private sector investors that enable pastoralists access to high value markets for milk.

Overview of the Intervention: This intervention will involve a number of stakeholders both in private and public sectors of the dairy value chain. Incentives will be found for pastoralists to organize themselves into viable cooperative societies that will aggregate milk from their members for sale to the

¹ O. A. Ndambi, T. Hemme and U. Latacz-Lohmann: Dairying in Africa - Status and recent developments; <http://www.lrrd.org/lrrd19/8/ndam19111.htm>

milk collection centres or aggregators that will preserve the milk for onward sale to processors. The MCCs could also serve as hubs for sustainable and easy access to inputs (feeds and veterinary drugs) for the pastoralists.

BIF intends to promote the business case for private sector investments in to milk processing business model services that will be developed by either the processing companies or other service providers. BIF will identify and make visible where alignment of interests of key stakeholders is possible to strengthen linkages between the Fabricator, the dairy processing cooperatives and the financier(investor) providers. Where key players understand the business case and incentives, BIF can provide further technical assistance to design profitable and sustainable business models for successful operation of Rural milk processing plant taking into consideration site-specific challenges and needs.

The business case will also outline incentives for pastoralists and other stakeholders to better organize milk aggregation by pastoralists through establishment, development and management of cooperatives. Incentives for the relevant government agencies to provide institutional support, access to financial and technical support for cooperatives (for example, facilitating possible access to credit facilities from Bank of Agriculture, microfinance and other financial institutions, where needed) will also be outlined.

Typical activities include:

- Research and articulation of a clear business case and incentives for the establishment of MCCs, RMP ancillary infrastructure and necessary organization and cooperation amongst value chain stakeholders
- Technical assistance for design of business models for the Rural milk processing plant and that will guarantee long-term sustainable operations.
- Institutional linkages with public and private sector investors to promote the development of RMPs.
- Technical assistance for design of training modules (content) for pastoralist producers on cooperatives formation, management and delivery of effective membership services.
- Support capacity development for key public and private sector actors promoting cooperatives formation and effective cooperative operation.

Potential benefits include:

- Expanded access to profitable markets for fresh milk produced by pastoralists
- Functional MCCs and CCS enabling better quality milk and reduction in spoilage of fresh milk.

- Increased supply and availability of milk needed by dairy processing companies thereby enabling increased substitution of imported powder milk.
- Improved access to quality and affordable inputs including feeds (concentrates) and veterinary drugs managed under cooperative systems for pastoralists.

