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Analysis of Ghana's Local Milk Value Chain: barriers to competitiveness

Boimah M.¹, Gunarathne A.² and Behrendt L.²

¹ Thuenen Institute of Market Analysis, Braunschweig, Germany

² Thuenen Institute of Farm Economics, Braunschweig, Germany

mavis.boimah@thuenen.de

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Summary

Ghana imports more milk and other dairy products yearly than it produces. Even for what is processed domestically, almost all are exclusively made from imported milk powder. It is in this regard that this study was initiated to analyze the barriers to the local dairy sector's competitiveness employing both primary and secondary data sources. For the collection of primary data, in-depth interviews were conducted with key informants. A total of 34 actors along the local fresh milk and milk powder value chains were sampled and interviewed and the data descriptively analyzed. Results show that the local milk value chain of Ghana is informal, not developed and with minimal value addition to fresh milk compared to the value chain of imported milk powder. Moreover, local products sold on the Ghanaian markets do not undergo any form of safety tests and have not been approved by the regulatory and standard authorities. Further, a host of challenges along the local milk value chain are identified as factors limiting its competitiveness. Nevertheless, a window of opportunity for developing the local milk value chain is presented considering the growing demand for fresh milk-based dairy products in Ghana as well as increasing international trade to integrate into the Global Value Chain.

Keywords: Ghana, value chain analysis, dairy, milk powder, fresh milk

JEL Classification codes: Q12, Q13, Q18

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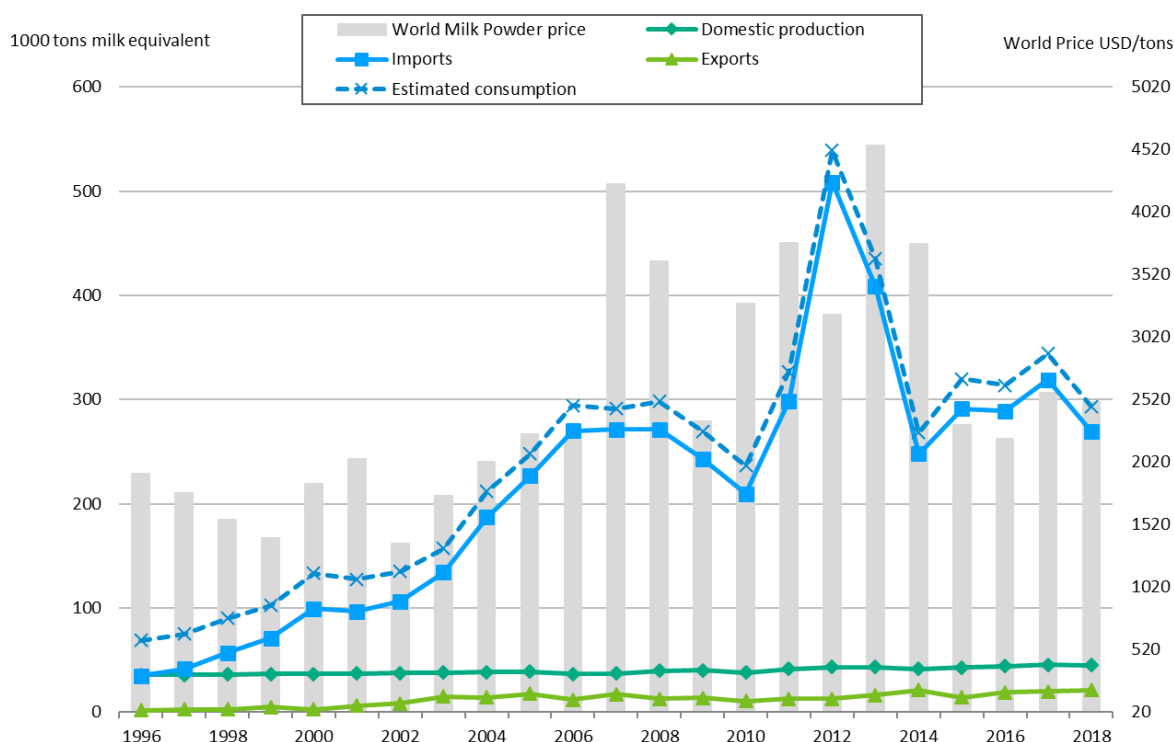
² Thuenen Institute of Farm Economics, Braunschweig, Germany

1. INTRODUCTION

Ghana has long been a net importer of dairy products (Zamani et al., 2021; Oppong-Apene, 2016) mainly because its livestock sector over the years barely witnessed any meaningful growth. For instance, the sector's contribution to GDP has continually declined since the year 2015 from 3.7% to 3.0% in 2017 and further to 2.5% in 2019 (GSS, 2020). As Figure 1 illustrates, domestic milk production remained stagnant from 1996 to 2018 (Zamani et al., 2021). Notwithstanding, the nation's consumption of dairy products continue to soar due to population growth, increasing per capita incomes, and the demand for more healthy diets. According to Zamani et al. (2021), the per capita consumption of milk between 1996 and 2018 increased by 153.8% (from 3.9 to 9.9 kg/capita/year), while the self-sufficiency rate of milk and its products in Ghana fell steadily from 44 % (1996-1999) to 14 % (2014-2018) on average. Figure 1 shows some exports of milk mainly to neighbouring countries but in insignificant volumes. Imports originate mainly from Germany, Belgium, Denmark, France, Greece, the Netherlands, Spain, United Kingdom, Thailand, and South Africa. Notable among the products imported are milk powder, liquid milk, yoghurts, ice cream, and cheese, with milk powder forming the largest part of imports and consumption.

European dairy companies continue to expand their operations in Africa, with a significant presence in West Africa (Corniaux, 2017; Orasmaa et al., 2016; CTA, 2014) largely due to the high demands for dairy products in this region. Criticisms have however erupted and still on-going regarding the activities of these multinational EU dairy companies by some international organisations and Civil Society activists (CTA, 2014; Vielajus, 2006). The critiques point to EU's cheap dairy imports as the principal reason behind the underdevelopment of the domestic dairy sectors of these West African countries (Rudloff & Schmiege, 2016; and Vielajus, 2006).

Milk in Ghana is produced in three different systems (the extensive, semi-intensive, and intensive) mainly as a by-product of meat production. The majority of milk is produced by Pastoralists in the extensive system who keep either their own cattle or herd the cattle for an absentee owner. In this system, the milk is often used as payment for the herder, either in addition to other payment or as an exclusive payment. Pastoralists are often Fulani who traditionally produce and consume milk, and convert the surplus/excess into a soft cheese called Wagashie for sale (Gidiglo, 2014; Ndambi, 2008; Oppong-Apene, 2016). Cow breeds used in this production system are usually WASH, Sanga or Zebu and produce between 0.5 to 3 liters of milk per day. There is a very small number of intensive dairy farms located around urban centres, who use higher yielding dairy cows, and come to 7 to 14 litres of milk per day (Oppong-Apene, 2016).

Figure 1: Development of the Dairy Sector in Ghana from 1996 to 2018 (in 1000 tons, milk equivalent)

Note: Domestic consumption is estimated based on imports + production - exports. Storage was not considered.
Source: Zamani et al., 2021.

Though literature documents studies on Ghana's local milk value chain, e.g., Guri, Ameleke, & Karbo (2018) and Oppong-Apene (2016), these studies focused on reviewing the status of the value chain while identifying gaps in policies formulated in the sector. No study has so far compared the performance of the local milk value chain with the chain of imported milk powder. In some countries, e.g., Senegal, there is an overlap of these two chains where local milk is combined with milk powder for some dairy products, however, in Ghana they are virtually distinct from each other. This study contributes to the literature in a unique way. First, the value chain depending on both local fresh milk and imported milk powder are mapped out and described. Actors and their respective activities (i.e., value addition) in the value chains are identified and compared. Second, the barriers hindering progress and competitiveness of the domestic dairy sector are identified and discussed, allowing us to draw implications for policy recommendations.

2. DATA AND RESEARCH METHODOLOGY

2.1. *Description of the study area*

This study was conducted between February 2020 and May 2021 in the areas with the highest cattle population in Ghana (Bondase, Abokobi, Adelakope, Agbogba, Tema, Tamale, Shai Osudoku, Amrahia, Pokuase, Tulakuu, Awdodome). Though dairy processing takes place in all the 16 regions of Ghana, the majority are concentrated in the capital city, Accra. The average annual temperature range is between 18°C and 40°C in the southern and northern parts of Ghana. Rainfall is concentrated in a major (April-July) and a

minor (September-November) season in Southern Ghana with only one rainy season occurring in the North from May to October, followed by a long dry season from November to May (Environmental Protection Agency, 2011).

2.2. *Data collection and analysis*

The study dwelt on both primary and secondary data sources. Secondary data was based on desk reviews of relevant literature (e.g., reports, articles, etc.). For the primary data, a snowball sampling method was employed to identify key actors in both the fresh milk and milk powder value chains in Ghana. A total of 34 key actors at different levels of the value chain were selected and interviewed either face-to-face or via telephone and included - input suppliers, producers/farmers, processors, and marketers (hypermarkets, supermarkets, and street vendors). Farmers were selected purposively to represent the typical production systems in Ghana - intensive, semi-intensive, and extensive. The study also sampled both fresh local milk and milk powder processors. Regarding milk powder, small, medium, and large-scale processors were purposively selected and interviewed. In the fresh milk value chain, small and mini processors were interviewed. The data was gathered using semi-structured interview guides. The interviews were recorded, transcribed and analysed using content analysis to objectively and systematically identify specified characteristics and patterns in responses (Holsti, 1969).

2.3. *Description of sample*

Feed suppliers and the suppliers of cattle begin the local milk value chain. We identified 2 major feed suppliers, that supply cassava peels and wheat bran to farms. And one cattle supplier, that involve in buying and selling cattle. Six producers of fresh milk were interviewed based on the cattle rearing systems and three milk collectors with capacities of 25, 300 and 2000 litres per day. Four groups of dairy processors are identified in Ghana based on the average volumes processed per month - large-scale (240 tonnes), medium-scale (120 tonnes), small-scale (15 tonnes), and mini (7 tonnes). Though processing is done across the entire country, large, medium, and small-scale processors are found mainly in cities, with the majority located in the capital city, Accra. In exception of some few small-scale processors who use fresh milk for some specific products, these large, medium and small-scale processors rely entirely on milk powder for their products. In this study we interviewed one large processor of a range of frozen yoghurts and ice creams for the Ghanaian and neighbouring West African markets (Ivory coast, Togo, Benin, and Burkina Faso). Besides, two medium-scale, four small-scale, and two mini processors of yoghurts (plain, flavoured, added fruits, added cereals) were interviewed. Of those interviewed four processors use only fresh milk, two processors combine fresh milk with milk powder, and 10 processors were relying solely on milk powder. In the downstream of the value chain, two hypermarkets, and four street vendors, involved in the retail of local, domestically processed and imported dairy products were interviewed in order to obtain information on prices, consumer preferences, and products on high demand.

Table 1. Value chain actors and stakeholders interviewed

Actors/stakeholders	No. interviewed
Actors: local fresh milk	
Feed supplier	2
Cattle supplier	1
Producers/farmers	6
Milk collectors	3

Processors	6
Street vendors	4
Actors: imported milk powder	
Large-scale processor	1
Medium-scale processor	3
Small-scale processor	4
Mini processor	2
Retailer (Hypermarket)	2
Source: own elaboration	

3. RESULTS

3.1. *Local milk value chain*

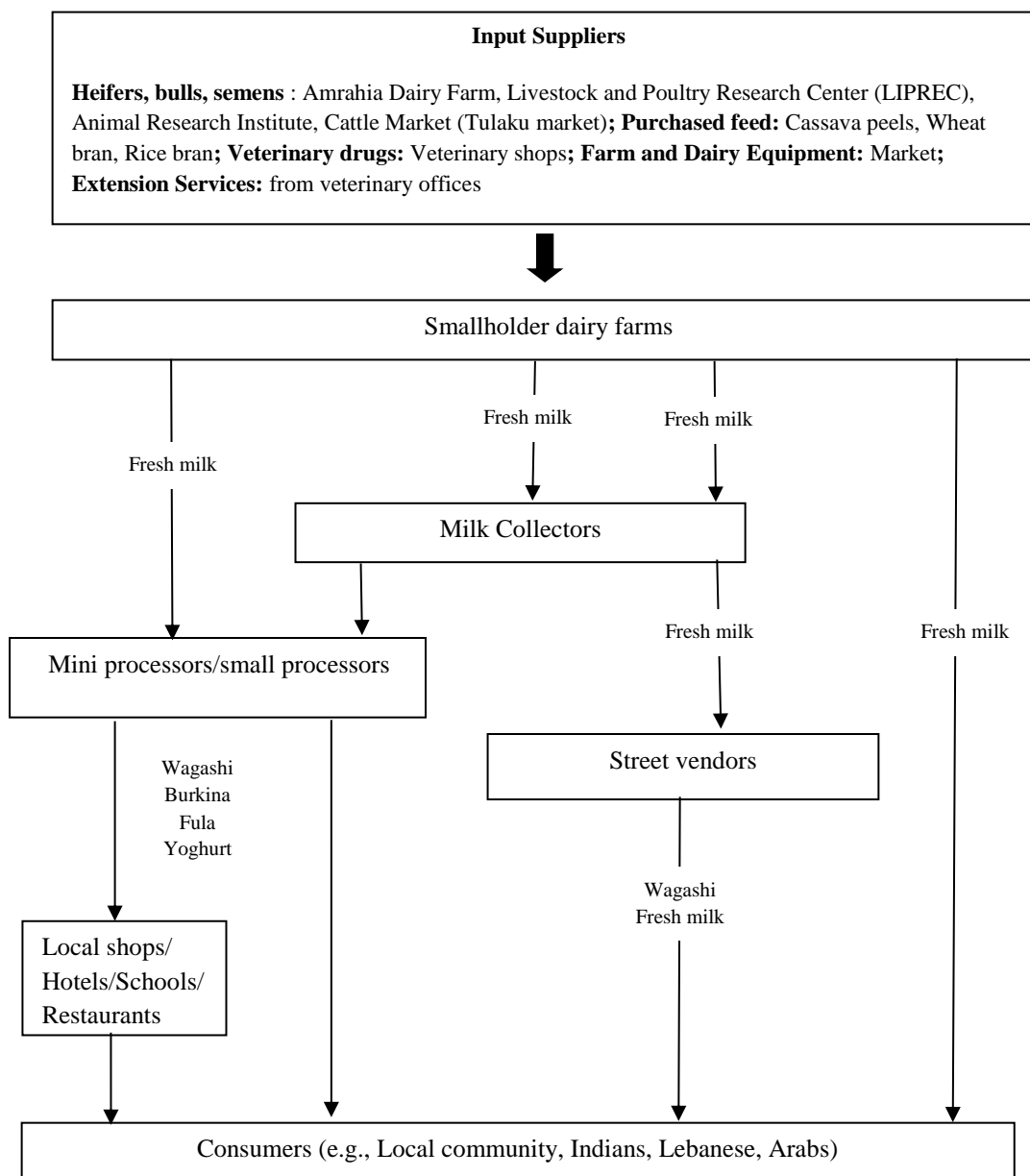
An overview of the local milk value chain is depicted in Figure 2. The main actors in the local milk value chain are input suppliers, farmers, milk collectors, processors, wholesalers, retailers, and consumers. Fresh milk and value-added dairy products take various routes from farmers to consumers.

Input suppliers and service providers: Many actors are directly and indirectly involved in input supply. Main inputs such as heifers and bulls are usually obtained from government research institutions (Amrahia Dairy Farm, Livestock and Poultry Research Center, and Animal Research Institute), Tulaku cattle market, or from other cattle farmers. Agro feed manufacturers, including cassava processors, wheat processors, and rice millers supply mainly intensive producers of cattle with agro by-products (cassava peels, wheat bran, rice bran, etc.). In addition, farmers usually buy salt, minerals, and veterinary drugs from veterinary shops. Many development partners, service providers, dairy farmers and processors Associations, Women in Agriculture Development (WIAD), the Ministry of Agriculture, the University of Ghana's Dairy Consortium, Nutrition and Food Science Department of the University of Ghana also support milk value chain actors in Ghana.

Producers/milk production: milk production in Ghana is mostly from indigenous cattle breeds kept by Fulani herdsmen. The production system of dairy is broadly classified into three systems: intensive, semi-extensive, and extensive. The **intensive** system employs zero-grazing and is mainly managed with few cattle in the backyard in urban areas of the Eastern and Greater Accra Regions of Ghana. In this system, an average of three cows, three calves, and occasionally a bull, generally Jersey breed, Friesian-Sanga crossbred, and local breeds are raised. Milk production is of the highest interest in this system with around 13 litres per cow per day. The **semi-extensive** dairy production system usually provides housing, crop residues and feed supplements as an add-on to grazing. Few farmers are engaged in this system, with the cattle owned mainly by businessmen who are largely absentee farmers. This system generally has crossbred cows from Jersey, Nigerian, and local breeds of cows. The average milk production per cow per day is 3.0 litres and 1.5 litres in the wet and dry seasons respectively. The **extensive** production system is the dominant system practiced by smallholder farmers where grazing is done extensively on a free range. These farms typically keep on average 27 milking cows and three bulls, of which are crossbred cows from the West African shorthorn, and white Fulani called Sanga. The Sanga cattle breed is well adapted to the arid conditions of Northern Ghana. On average milk produced per cow per day is 4.0 litres and 0.8 litres in the wet and dry seasons. The main objective for raising cattle in the extensive system is for meat (beef), therefore, milk collected is first shared between the

herdsman and calves. The surplus milk after consumption by the household and animals is processed by the wives of cattle producers or is sold to collectors/middlemen and processors for extra income.

Figure 2: Overview of the local milk value chain



Milking is usually done manually, and milk is collected and stored in plastic containers, plastic bottles, and plastic jars (jerry can). Farmers do not clean the udder and hindquarters of the cows before milking while milking usually takes place in Kraals resulting in poor quality milk filled with bacteria and other pathogens. After milking, Fulani herdsmen themselves or collectors transport the milk by bicycle or by foot to local markets or to small and mini processors, however, farmers also deliver fresh milk directly to consumers. Milk produced is often sold immediately due to the lack of cooling facilities and electricity supply for refrigerators. Raw milk is a highly perishable commodity which should be chilled immediately after milking

to the required temperature to avoid it going bad. However, it is practically a challenge to chill milk on the farm. Unprocessed surplus milk is thrown away due to the lack of refrigerating units. The prevailing farm gate price of fresh milk is between € 0.20 and 0.88. The farm gate price of milk is determined by buyers based on the distance to the nearest market. The longer the distance, the lower the price bargained per litre of milk. The long distance between farmers and milk collectors leads farmers to milk their cows once per day, primarily due to the lack of storage and processing facilities. Farmer initiative programs are required to establish milk collection centres at the village level closer to the communities. In this case, farmers would not have to transport raw milk over long distances while incurring extra costs.

As an alternative to transporting over long distances, farmers process milk into wagashi especially during the wet season, when there is a surplus of fresh milk. To use the surplus milk produced during the wet season, in this farming system, about 40% of milk produced per day is converted into wagashi. This is expected as the wet season is characterized by abundant forage and water. Milk processing at the farm level helps farm households to earn higher cash incomes compared to incomes from selling raw milk, to deal with seasonal variation in milk supply, and lack of storage facilities.

Photo 1: Milk collector



@Stephen Awuni, CSIR-STEPRI

Photo 2: Street vendor-Wagashi (cottage cheese)



@Stephen Awuni, CSIR-STEPRI

Photo 3: Yoghurt (milk powder)



@Stephen Awuni, CSIR-STEPRI

Photo 4: Yoghurt (local milk)



@Stephen Awuni, CSIR-STEPRI

Milk collectors: ‘Milk collectors’ who buy milk directly from farmers/Fulani herdsmen also play a significant role in the informal market (Photo 1). They collect milk at the farm gate and bring it directly to processors such as Emadom Yoghurt, Nanee Yoghurt, Dafa Dairy Products, and the general public. Milk collectors mainly utilize their motorbikes as a means of transportation. The current selling price per litre of milk ranges between € 0.80 to 0.86. Nevertheless, collectors are faced with challenges such as a short supply of fresh milk in the dry season, high supply of fresh milk in the wet season which goes bad due to lack of storage facilities, and high cost of transportation due to the long distance to the farm for milk collection.

Processors: Mini and small-scale processors use fresh milk for processing wagashi (cottage cheese), burkina, yogurt, and for selling fula. In exception of the organoleptic test (i.e., taste, smell, and physical eye observation) no other tests are performed. So far, only two small processors of fresh milk are identified in Ghana with products which are certified by the Food and drugs Authority of Ghana. Also, their products are neatly packaged and well labelled. These processors supply their products directly to supermarkets, local shops, hotels, and restaurants. Other mini processors produce pasteurized milk, “wagashi” (cottage cheese), yogurt (Photo 3 & 4), and “burkina,” and they are directly sold in open markets, on streets and in communities by female hawkers. Products of these mini processors have not undergone any form of testing and approval by the Food and drugs Authority and the Standard Authority of Ghana. Therefore, no well-established mechanism for quality control and quality assurance of local milk products exists. Most of these products as well do not bear labels with traceable information.

Street vendors: Street vendors buy milk and wagashi from cattle farmer and their wives, and from milk collectors and sell them directly to consumers without packaging. The wagashi are primarily stored in large aluminium containers and plastic drums (Photo 2). However, there are no specific quality control regulations and standards to protect consumers. Milk handling, processing, and distribution practices are not hygienic and are traditional throughout the milk value chain.

However, there is a growing demand for fresh milk-based dairy products by Ghanaians and immigrants such as Indians, Arabs, and Lebanese, presenting an opportunity not only for meeting local demands but also to integrate into the Global Value Chain (GVC).

3.2. *Milk powder value chain*

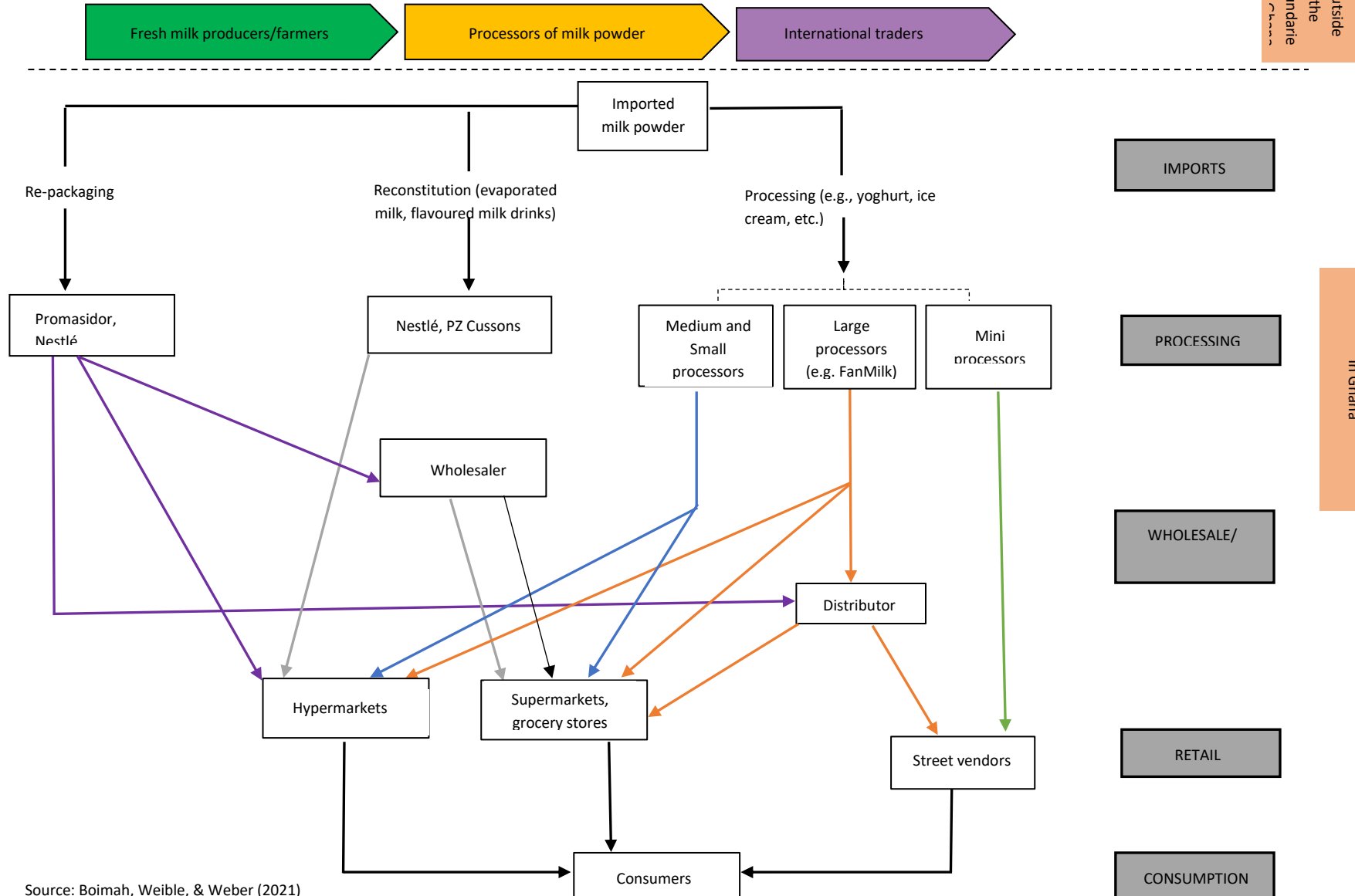
The main actors in the milk powder value chain are importers, re-packagers, re-constitutors, processors, distributors, wholesalers, retailers and consumers. As illustrated in Figure 3, milk powder imported into Ghana is either re-packaged, re-constituted or processed into other products (e.g., yoghurts). Re-packagers are big companies who import milk powder in larger units such as sacs and then re-package them into smaller units (e.g., sachets and tins) with either local or international brand names. Milk powder is the most common re-packaged product and the most widely sold dairy product on the Ghanaian market. In few cases, some value addition occurs in the form of flavouring or an added beverage (e.g., chocolate, coffee). Re-packagers are usually multinational companies with a subsidiary in Ghana. Re-constitutors just like re-packagers are multinational companies involved in the production of liquid milk from milk powder. Evaporated milk and flavoured milk drinks are their main products. The third group are processors who transform milk into other products and are the main focus of the discussion in the milk powder value chain. Processors are involved in the transformation of milk powder into other products such as yoghurts, ice cream, Burkina, etc. Main products in the milk powder value chain therefore are yoghurts (plain, with cereals or fruits), evaporated milk, flavoured

milk drinks, “burkina” (yoghurt mixed with millet), and milk powder (re-packaged, re-branded, flavoured) in smaller units such as sachets and tins.

Processed products of large, medium and small firms are certified by the Food and Drugs Authority and the Standards Authority of Ghana. These products are well packaged bearing labels with traceable information (e.g., product composition, date of production and expiry). On the other hand, products of most mini processors do not bear certification labels, meaning that, they operate without approval of the aforementioned certification authorities. Besides, products of mini processors are poorly packaged and are without labels providing relevant product information.

In the distribution channel, large-scale processors supply products directly to hypermarkets and some supermarkets. Also, products of large-scale processors are supplied to distributors who serve as middlemen or wholesalers between processors and retailers. However, medium and small processors directly deliver products to retailers including grocery shops located in communities in cities and urban centres across the country. Two channels are identified in the retail of dairy products in Ghana - out-door and in-door. Tricycles, bicycles, and head carriers are used to retail products on streets, communities, market centres, etc. while in-door vending occurs in hypermarkets, supermarkets, and grocery shops. Ghana’s dairy market has tremendously developed over the past ten years and is still growing due to increasing population, urbanization and growing consumer demands for dairy products. Consequently, it has increased the number of actors at all levels of the milk powder value chain who have embraced the opportunity to make profits.

Figure 3 The Value Chain of Imported Milk Powder



4. DISCUSSION

The value chain that depends on imported milk powder is extensive compared to the local milk value chain. As illustrated in Figure 3, the value chain begins with producers in the countries of export, who supply collected milk to industries that transform liquid milk into powdered form, packaged and traded on the international market. The **input-output structure** of milk powder thus takes place outside of Ghana and has a wide **geographic scope**. Multinational companies therefore leverage their competitive advantages in assets. For instance, dairy companies based abroad (Promasidor, Nestlé, etc.) with their high skilled human resource, engage in research and development, producing a range of milk powder products from fresh milk. Their subsidiaries in Ghana take advantage of low labour costs to re-package and re-constitute milk powder and the final products are distributed in Ghana and some other west African countries.

Large and some medium-scale processors import milk powder by themselves while small-scale and mini processors buy milk powder from traders on the local markets. In terms of **governance**, processors of milk powder and traders in the competitive international market have the greatest influence on milk powder prices. However, a minimum level of vertical coordination can be seen in the domestic value chain of milk powder even though final products and prices are determined by individual actors (e.g., processors, wholesalers, retailers) in the chain. For instance, processors receive feedbacks from distributors, retailers, and consumers, which helps them in the process of upgrading and product improvement. Also, processors are signalled on changing consumer preferences and market demands. **Institutional framework** in value chain analysis identifies how local, national and international conditions and policies shape the globalization in each stage of the value chain (Gereffi, 1995). The Common Agricultural policy (CAP) and the abolition of milk quotas are contributory factors to the excess supply of milk in EU countries. That being the case, dairy companies have resulted to capitalizing on increasing global trade of milk and its products notably milk powder because of its advantage over other dairy products (e.g., yoghurt, ice cream, UHT milk, etc.) - a longer shelf life and cheaper prices. At the national level, lower tariffs (5%) and the absence of non-tariff barriers evidently are favourable conditions for milk powder imports into Ghana. Milk powder is thus cheaper, more available at all times and has a longer shelf life when compared to local fresh milk. Additionally, there are no existing barriers to entering Ghana's dairy processing sector in exception of the mandatory requirements of registering the firm and obtaining product certification from the appropriate authorities.

Local milk supply on the other hand is not constant in the year as availability of fresh milk on the market heavily depends on rainfall and pasture conditions. The nutritional quality of the pastures and cereal residues are limited during the dry season. In the study areas, local breeds with low milk yields are mostly raised under open grazing systems, leading to extremely low milk yields during the dry season. There is indeed a scarcity of fresh milk in the market during the dry season because most of the milk produced locally is coming from this system of cattle rearing. Hence, communal grazing lands could be improved through the introduction of improved forage varieties such as Napier grass (*Pennisetum purpureum*) (Mureithi & Djikeng, 2016) *Brachiaria* grasses (Adnew, Tsegay, Tassew, & Asmare, 2018) for better feeding of dairy cows during periods of feed scarcity. Moreover, the local breeds of cattle raised in the extensive system have low genetic potential for milk production as natural mating is the sole practice for crossing cows. Artificial insemination and higher-grade bulls may be utilized to produce cross breeds for improving milk production.

The value chain of local fresh milk is informal and short. Local milk handling and processing practices are purely traditional and not hygienic. Products from fresh milk are limited (pasteurized milk, wagashi, burkina, and yoghurt). Appropriate hygienic methods should be introduced, processing should be modernized,

while value added products such as UHT milk and other forms of cheese introduced. It is identified from the study that all actors in the local value chain do not have any formal training on milk handling, packaging, and marketing. Local dairy products are thus characterized by poor packaging. In this regard, training and extension programs are needed to improve the capacity of all actors along the value chain.

While milk production is low and scarce to find in Ghana, dairy processing on the other hand is witnessing a continual growth due to increasing consumer demands attributed to urbanization, population and income growths. Processors, as a matter of fact, rely largely on milk powder based on the aforementioned attributes to satisfy consumer demands. Nevertheless, some few small-scale firms process specific products such as cream cheese from fresh milk but in small quantities (on average 60litres equivalent to 0.021 tonnes) due to the limited supply and high price of fresh milk (1litre of fresh milk costs € 1.03 while a 25kg bag of milk powder is sold between € 58.82-102.94. A 25kg bag of milk powder can process on average 150 litres of yoghurt. However, to process an equal amount of yoghurt from fresh milk will cost on average € 168.6, more than double the minimum cost of using milk powder.

More people are engaged in the milk powder value chain and receive better incomes in comparison to the jobs and incomes in the local milk value chain due to accessibility and affordability of milk powder. Final products of milk powder are also diverse, with good packaging, certified, longer shelf lives, more available, and affordable (lower prices).

5. CONCLUSION

It is obvious from the study that the local milk value chain is underdeveloped. The supply of fresh milk is seasonal and highly perishable with much milk collected going bad due to the lack of storage facilities. Sanitation is a major problem in the fresh milk value chain, beginning with milking down to marketing. Milk powder has an advantage over fresh milk – it is a dry product that requires no form of storage such as cooling and can be stored and used over a long period of time. The success of the dairy processing industry in Ghana is therefore absolutely credited to the availability of imported milk powder. The processing industry as well to a large extent is formalized with certified, well packaged, and labelled products that can be stored for longer periods compared to products in the local milk value chain. Regardless of the challenges with local milk supply in Ghana, fresh milk and its products are on high demand. The local dairy sector thus has the potential not only for meeting domestic demands but also to integrate into the global dairy value chain. Yet, this would remain a mirage if the myriads of challenges serving as bottlenecks to the progress of the industry are not adequately addressed. Competitiveness of Ghana's local dairy sector requires an upgrade in the standard of local milk production, processing, and packaging, in other words, all activities along the entire dairy value chain must be modernized. Cattle production would have to shift from the traditional extensive system (where feeding becomes difficult in the dry season and milk production subsequently goes down) to more modern ones such as the intensive and semi-intensive systems. Likewise, improved breeds of cows with high milk yielding traits should be acquired to increase milk quantities while ensuring an all-year production of milk. Besides, industrialized milk processing must displace the traditional artisanal processing methods through investments in infrastructure and training. Industrialization will lead to higher value added and more diversified dairy products. Also, conditions that favour the installation of processing factories in milk production zones must be created by the government to prevent wastage of milk produced by farmers. The government is advised to reduce the importation of dairy products by raising tariffs to promote local dairy products, however, this should be done only after the local production sector is first developed.

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References

- Adnew, W., Tsegay, B. A., Tassew, A., & Asmare, B. (2018). Assessments of farmers' perception and utilization status of Brachiaria grass in selected areas of Ethiopia. *Biodiversitas Journal of Biological Diversity*, 19(3), 955–966. <https://doi.org/10.13057/biodiv/d190326>
- Boimah, M., Weible, D., & Weber, S. (2021). Milking Challenges while drinking foreign milk. *Proceedings in System Dynamics and Innovation in Food Networks 2021*. www.centmapress.org.
- Corniaux, C., 2017. Situation et potentiel du secteur laitier au Burkina Faso. CIRAD-Département ES.
- CTA, 2014. The evolving EU – Africa dairy trade : EU corporate responses to milk production quota abolition. Agritrade, Special report-September 2014.
- Donkor, E., Aning, K., & Quaye, J. (2007). Bacterial contaminations of informally marketed raw milk in Ghana. *Ghana Medical Journal*, (41).
- Environmental Protection Agency (2011). Ghana's Second National Communication (GSNC) to the UNFCCC: United Nations Development Programme.
- Gereffi, G., 1995. Global production systems and third world development. In B. Stallings (Ed.), *Global Change, Regional Response: The New International Context of Development*. Cambridge; New York and Melbourne: Cambridge University Press.
- GSS, 2020. Ghana Statistical Service: Statistics for Development and Progress.
- Gidiglo, K. F. (2014). Milk Production and Marketing in Ghana: The Case of Accra Plains. *Journal of Biology, Agriculture and Healthcare*, (4).
- Guri, B. Z., Ameleke, G., & Karbo, N. (provisory document, 2018, November). The State of the Dairy Sector in Ghana.
- Holsti, O. R. (1969). *Content anaylis for the social sciences and humanities*. Reading, Mass.: Addison-Wesley.
- Kunadu, A. P.-H., Aboagye, E. F., Colecraft, E. K., Otoo, G. E., Adjei, M. Y. B., Acquaaah, E., . . . Amissah, J. G. N. (2019). Low Consumption of Indigenous Fresh Dairy Products in Ghana Attributed to Poor Hygienic Quality. *Journal of Food Protection*, 82(2), 276–286. <https://doi.org/10.4315/0362-028X.JFP-18-146>
- Mureithi JG, Djikeng A. Overview of the climate-smart Brachiaria grass programme. In: Njarui DMG, Gichangi EM, Ghimire SR, Muinga RW, editors. (2016). *Overview of the climate smart Brachiaria grass programme*: Kenya Agricultural and Livestock Research Organization. Retrieved from <https://cgspace.cgiar.org/handle/10568/80130>

- Ndambi, O. A. (2008). *Perspectives for dairy farming systems in Africa* (Dissertation). Christian-Albrechts-Universität zu Kiel, Kiel, Germany.
- Opong-Apene, K. (2016). *Review of the Livestock/Meat and Milk Value Chains and Policy Influencing them in Ghana*.
- Orasmaa, T., Duteurtre, G., Corniaux, C., 2016. The end of EU milk quotas - implications in West Africa: Literature review and future perspectives. CIRAD.
- Rudloff, B., Schmieg, E., 2016. More bones to pick with the EU? Controversial poultry exports to Africa: sustainable trade policy as a task for the G20.
- Vielajus, J., 2006. Lait l'Europe est Vache avec l'Afrique. *Altern. ÉCONOMIQUES* No. 251 bis Octobre 2006.
- Zamani, O., Pelikan, J., Schott, J., 2021. EU-Exports of livestock products to West Africa: An analysis of dairy and poultry trade data. Thünen Working Paper 162.