

SWOT ANALYSIS OF TRADITIONAL SKIMMED MILK CHAIN AROUND GREATER CAIRO

S. Abdelghany¹, C. Corniaux², V. Alary³, M. A. Radwan¹ and Amal K. El-Asheeri¹

1-Animal Production Department, Faculty of Agriculture, Cairo University, Giza, Egypt, 2- International Centre for Research in Agriculture and Development (CIRAD), Montpellier, France, 3- CIRAD/ICARDA (International Center for Agricultural Research in the Dry Areas), Rabat, Morocco.

SUMMARY

The aim of this study was to apply SWOT analysis on traditional skimmed milk chain around Greater Cairo which considered as one of the main dairy markets in Egypt. This study was carried out in El-Reka village located in south of Greater Cairo, (Giza governorate), nearby Beni Suef governorate. SWOT analysis was applied including food safety aspect and value chain analysis to raise the major advantages and constraints of the traditional sector. This study was based on regular field visits, interviews, and analysis of milk samples. Main stakeholders of the chain were farmers, owners of milk collection points, owners of milk collection centers, and owners of dairy processing units. SWOT analysis allowed highlighting the major role of the social network to explain the flexibility and adaptability of this sector to the major constraints in link with international competitiveness and national constraints, mainly on the limitation of land access. Other weaknesses concerned high feedstuffs prices on markets, and lack of public services, in terms of milk quality control and herd management at farm level. The high dynamic of the traditional sector was identified, particularly at milk collection points in terms of quantity of collected milk and milk price. However, the social network opens interesting opportunities to develop efficient and flexible services. These elements could help decision makers and developers to prioritize sustainable development activities in link with global agenda of the agricultural sector and increasing demand for dairy products in Egypt. Selling skimmed milk is the most attractive scenario for small farmers that led to a fast growing of skimmed milk collection compared with whole milk. The traditional skimmed milk chain showed high ability to adopt quality control protocols based on market signals and milk processing units' standards. Governmental and non-governmental activities could propose new policies to protect the traditional actors along the chain. Specific dairy quality control programs should be developed along the chain. Therefore, dairy sector regulations and rules should be reviewed to make balance along the chain and to set fair pricing system and guarantee food safety for all consumers in local villages and cities markets.

Keywords: *Traditional skimmed milk, value chain, SWOT analysis, buffaloes, Greater Cairo*

INTRODUCTION

Egypt is one of the countries with the highest urban population density along the Nile Valley and Nile Delta. The total population reached 88.4 million in 2015 (CAPMAS, 2015). Agriculture is one of the main sectors of the Egyptian economy (13.2 % GDP in 2010, El-Ramady *et al.*, 2013), which providing livelihoods for 55 % of the population and about 30 % of employment (IFAD, 2012). Dairy sector is one of the main agricultural sectors with high socio-economic impacts on rural communities and providing dairy products for both rural and urban areas.

According to FAO (2015), Egypt produced about 5.9 million tons of whole milk in 2013; about 2.6 million tons out of that was produced by buffalo representing 44.1 % of milk production. Huge amounts of milk are produced by traditional farms through local cattle and buffalo hold by smallholders in scattering herds and fragmenting production as reported by Abou El-Amaiem (2014). This traditional sector was suffering from many problems; one of them is the lack of recording systems or quality

control practices that limit planning and improvement activities. Besides, this traditional sector offers a lot of jobs and plays an important economic and social role in the rural communities, where the majority of the demand depends on the traditional dairy products.

Commercial dairy companies use mainly cattle milk which is produced by large and medium commercial farms with high quality and they also depend on the imported powder milk to cover 20-50 % of quantity required to be processed by industrial dairy processing plants.

A supply chain is a network of retailers, distributors, transporters, storage facilities and suppliers involved in the production, transportation and marketing of a specific product (Bacarin *et al.*, 2004). Webber and Labaste (2010) reported that value chain approach is used to guide and to enhance impacts of sustainable initiatives focused on improving productivity, competitiveness, entrepreneurship, and the growth of small and medium enterprises. In the dairy chain, milk collection center (MCC) is a "logistic" link between farmers and processing industrials (Demirbas *et al.*, 2009). Also, MCCs play intermediary roles for

smallholders to enable them to enter the commercial selling of milk through the processors and get access to the market. Also, MCCs were very important intermediaries to control milk quality and to guarantee food safety (Sayin *et al.*, 2011).

In Egypt, cheese is an important component of the daily Egyptian meals (Todaro *et al.*, 2013), mainly made from skimmed milk. Karish cheese (is an Egyptian white cheese made from buffalo or mixed buffalo and cattle skimmed milk, that yield around 20-30 %) is the most popular cheese in Egypt, especially in rural zones (Awad *et al.*, 2014). Egypt is the largest cheese producer in the Middle East and it is ranked the sixth on the world with a production of 720,000 tons in 2012. This production is expected to reach 980,000 tons in 2020 (Mikkelsen, 2014). The cheese consumption in Egypt was about seven kg/capita/year (Rome, 2006).

However, there is a huge data shortage about skimmed milk chain in Egypt. The current analysis was based on the supply chain approach that gives us the framework for identification and characterization of the actors involved in this value chain. The objectives of this study were: monitoring the dynamic of traditional skimmed milk chains around Greater Cairo and applying SWOT analysis to propose recommendations for policy decision makers and even researchers to improve the whole dairy production system.

MATERIALS AND METHODS

Source of data:

Our case study focused on the dynamic of one MCC specialized in skimmed milk collection. This study was carried out in El-Reka village located in south of Greater Cairo, (Giza governorate), nearby Beni Suef governorate. The MCC in El-Reka village is one of the main hubs of skimmed milk in Greater Cairo with a capacity of around 20 ton/day. This study started in March 2013 till August 2015. A total number of 21 farmers, eight milk collection points (MCPs) owners, one milk collection center (MCC) owner and 4 milk processing units (MPUs) owners were visited regularly and the interviews were based on semi-structure questionnaires. Also, MCC skimmed milk records from 2013 to 2015 were collected and registered. GPS check points for each point of the value chain were collected and used to draw maps by Arc GIS software (ArcMap 10.2.2). The data of the international prices of skimmed powder from 2010 to 2015 were collected through Global Dairy Trade (2015).

The analysis of milk marketing strategies (selling buffalo milk, selling skimmed milk plus butter and selling Karish cheese plus butter) were based on the primary data collected from farmers from winter 2013 till summer 2014. This follow-up included data regarding quantity of daily milk, milk marketing quantity and prices of fresh milk and dairy products (like skimmed milk, Karish cheese and butter). Besides, return percentage of price for buffalo milk,

cattle milk and skimmed milk were calculated based on recorded data collected from 1994 to 2015 at MCC level using this formula:

Return % = (selling price - purchasing price) / purchasing price * 100. (Botchkarev *et al.*, 2011)

Bacterial count analysis:

Complementary milk quality tests in terms of total bacterial count analysis were applied for milk samples (50 ml) that have been collected from 15 farmers per village in 16 villages which supplied the MCC and from 3 tanks (stored skimmed milk) located at the MCC, to count the total bacterial every three months (January, May and August 2015). These three periods represent the three main seasons: winter, spring and summer. This analysis was applied to judge the hygienic conditions at farm level, at village level and through transportation to the MCC. The test was carried out in Microbiology Research Lab at Cairo University Research Park (CURP). Simple descriptive statistics analysis were conducted at farm level, village level and processing level. The employment created by skimmed milk value chain has been estimated on the quantity of skimmed milk collected divided by the total number of labors and owners per each MCPs and MCC through three seasons (winter, spring and summer).

SWOT analysis:

All the qualitative and quantities data collected during the follow up and interviews along the chain have been used to apply SWOT analysis. SWOT analysis principles starts with defining current situations (pro SWOT) followed by analysis of external environment to define the Opportunities and Threats, then analysis internal environment to define the strengths and weaknesses (Bernroider, 2002). The results of SWOT analysis is usually used to elaborate the recommendations. In this study, the diagnosis of the current situation and the identification of the variables of the external and internal environment were based on the value chain approach.

RESULTS

Main actors along the skimmed milk value chain:

Identification of the main actors along the chain and the links between them was the basic step for the value chain approach. The main actors along the chain are shown in Figure (1). This approach allowed representing the links between different actors, the role of milk collection points in scattered villages and the central milk collection as a main hub for milk collection. In this value chain, the MCC linked transition points for all milk collected with market through collecting and cooling milk and reloading it again for milk processing units.

Milk production and marketing at Farm level:

The smallholders dominated in this area, which based on crop-livestock farming system with local

buffaloes and crossbred cattle. All characteristics of this system were presented in (Table 1).

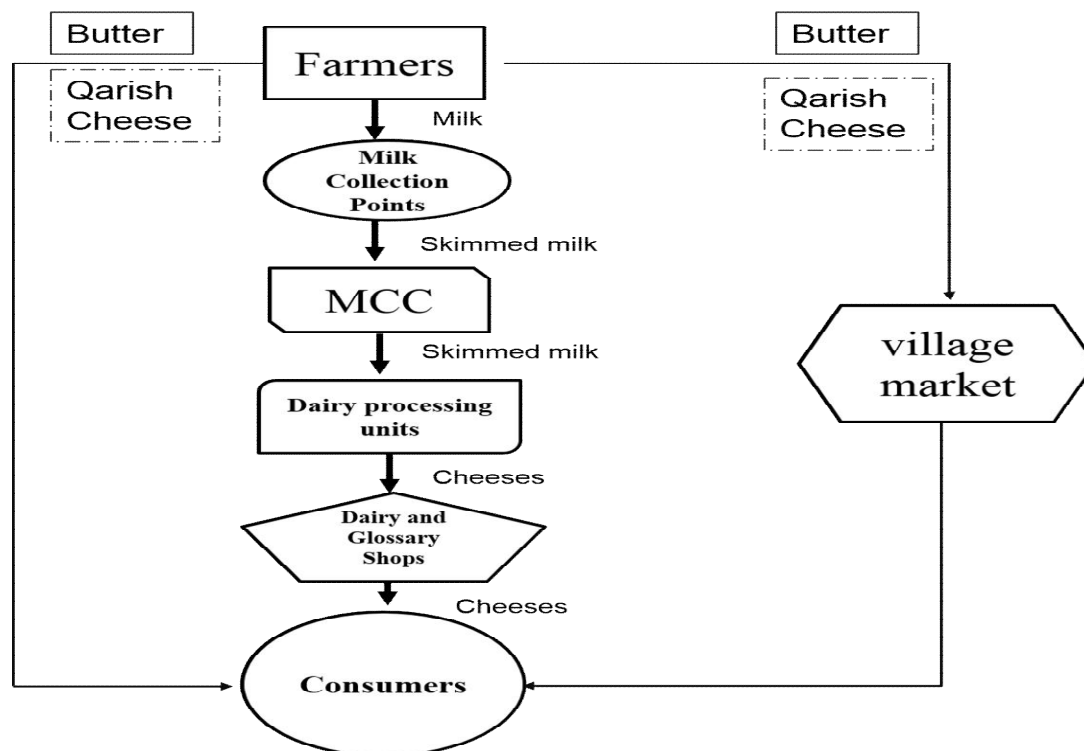


Figure 1. Skimmed milk chain map around Greater Cairo. (MCC: Milk Collection Center)

Table 1. Mean, Standard Deviation and Coefficient of Variation (%) of studied characteristics of crop/livestock farming system (21 farmers)

Item	Mean	SD	CV (%)	Min	Max
Family size	7.2	2.6	35.8	4.0	14.0
Farm size (hectare)	0.6	0.8	135.3	0.1	4.0
Cultivated area by forage (hectare)	0.3	0.2	79.3	0.1	0.7
Owned area (%)	23.9	35.6	149.7	0.0	100.0
Rented area (%)	76.1	35.6	46.6	0.0	100.0
Forage area (%)	57.0	25.6	44.8	17.1	100.0
Cereal area (%)	19.2	22.3	114.9	0.0	54.5
Vegetable area (%)	23.8	25.7	108.0	0.0	75.0
Herd size (heads)	3.1	2.9	92.6	1.0	13
Lactating animal (heads)	2.0	1.4	67.3	1.0	5.7
Milk production (kg/farmer/day)	8.9	5.6	63.4	4.0	25.5
Proportion of milk consumed as fresh from production %	9.1	4.3	47.0	0.0	15.4
Veal age at sold (day)	38.0	8.6	22.7	25	80

SD: Standard Deviation, CV: Coefficient of Variation

Farmers had different strategies for milk marketing as presented in Figure (2). They have a possibility for selling the whole buffalo milk by EGP 4.5 per liter or skim milk to get skimmed milk and cream. Cream was used to produce butter that could be sold by around EGP 45 per kg. Skimmed milk used to produce Karish cheese that sold by EGP 6 per

kg or the skimmed milk could be sold to MCC by EGP 1.25 per liter.

In Figure (3) milk receipted from different strategies per day per farmer (based on average 8.9 liter/day/farmer) have been estimated. Selling whole milk generates lower income compared to selling skimmed milk plus butter or selling Karish cheese and butter (149 % and 153 % of income relative to

sale whole milk, respectively). The third strategy needs a lot of efforts to process cheese and the marketing is highly risky due to technical and

economic uncertainties like high fluctuation of cheese price and demand. While, selling skimmed milk was guaranteed regular income for farmers.

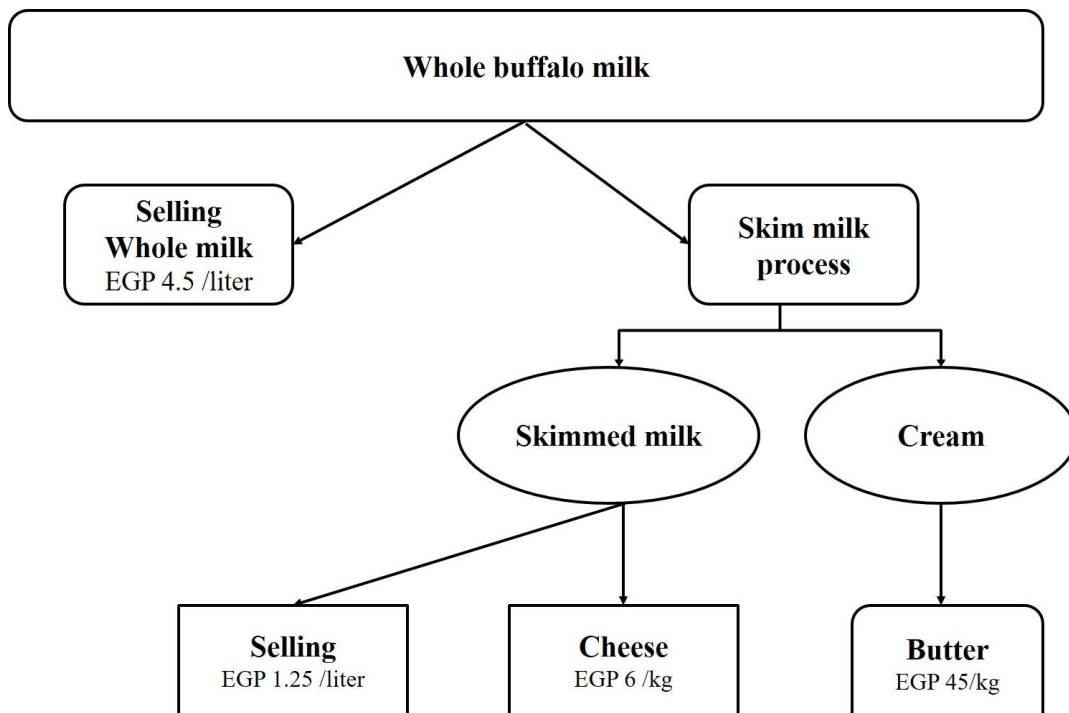


Figure 2. Description of the different strategies of milk marketing at farm level.

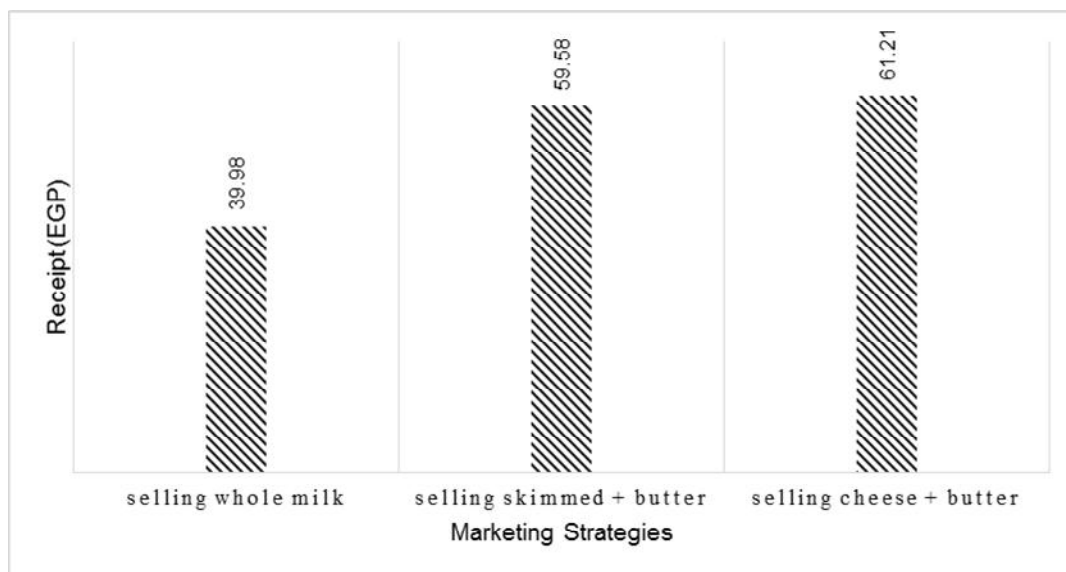


Figure 3. The Expected milk receipt from different milk marketing Strategies (as average daily receipt /farmer).

Milk collection points:

MCPs basically belong to MCC, MCPs had milk separators to produce milk fat and skimmed milk. The majority of owners of the MCPs were women. The separation operation was carried out from many years ago. After milking animals, women went to MCPs to get the cream and skimmed milk which used to produce butterfat and Karish cheese. The cost of separation was EGP 2-3 per head of animal/week.

The first MCP started dealing with the MCC since 15 years ago. Now, 239 MCPs distributed in 16 villages deal with the MCC of El-Reka. Table (2) shows the number of MCPs and number of farmers, while Table (3) shows the quantity of skimmed milk collected per each village through the three seasons in 2015. The peak of milk collection was in spring (38% of annual collection); followed by summer season (33%). The lowest amount of skimmed milk was registered in winter season (29%) (Table 3).

Table 2. Number of milk collection points, number of farmers and overall mean (\pm SD) per each village through winter, spring and summer seasons 2015

Village	Winter		Spring		Summer		No. MCPs		No. farmers	
	No. MCPs	No. farmers	No. MCPs	No. farmers	No. MCPs	No. farmers	μ	SD	μ	SD
V1	8	87	9	87	7	74	8	1.0	83	7.5
V2	14	206	15	244	16	248	15	1.0	233	23.2
V3	14	131	15	146	15	177	15	0.6	151	23.5
V4	2	16	2	25	2	43	2	0.0	28	13.7
V5	7	84	3	46	5	77	5	2.0	69	20.2
V6	8	149	9	195	8	204	8	0.6	183	29.5
V7	6	54	7	86	10	206	8	2.1	115	80.1
V8	11	263	14	275	15	230	13	2.1	256	23.3
V9	17	182	19	189	18	178	18	1.0	183	5.6
V10	31	273	35	310	33	298	33	2.0	294	18.9
V11	1	18	1	32	1	23	1	0.0	24	7.1
V12	42	509	48	621	47	769	46	3.2	633	130.4
V13	10	144	13	202	13	190	12	1.7	179	30.6
V14	20	319	21	306	23	331	21	1.5	319	12.5
V15	6	58	12	89	15	188	11	4.6	112	67.9
V16	9	62	11	107	11	145	10	1.2	105	41.5
Total	206	2555	234	2960	239	3381	226		2965	

MCPs: milk collection points, SD: Standard deviation, μ : overall mean.

Table 3. The quantity of skimmed milk (liters/week) through winter, spring and summer seasons 2015 and overall mean (\pm SD) per each village

Village	Winter	Spring	Summer	μ	SD
V1	4510	4425	2888	3941	912.9
V2	5364	6522	6282	6056	611.2
V3	3504	3872	3575	3650	195.2
V4	397	582	1148	709	391.3
V5	3542	3378	3778	3566	201.1
V6	3807	7085	5894	5595	1659.3
V7	1482	2590	4697	2923	1633.2
V8	8834	12316	7809	9653	2362.5
V9	6727	5152	5295	5725	871.0
V10	11426	14874	11072	12458	2100.2
V11	638	1032	503	724	275.1
V12	17336	26169	23877	22461	4583.7
V13	4849	7430	4714	5664	1530.6
V14	10420	11487	9077	10328	1207.6
V15	1630	2948	4821	3133	1603.3
V16	2042	2924	4657	3208	1330.4
Total	86,508	112,786	100,087		
	(29%)	(38%)	(33%)		

μ : overall mean, SD: Standard deviation.

Milk collection center (MCC):

El-Reka MCC dealt with around 3381 farmers through MCPs in 2015. MCPs sent weekly the milk quantities records that checked by the MCC. In

return, the MCC paid directly to farmers through MCPs. The price of one liter skimmed milk was between EGP 1.10 -1.40 for the farmers through the study period.

The MCC sent its labors (permanent workers without contract) twice a day to collect the skimmed milk by vehicles. The collectors measured the density for each MCP by Lactometer, and then the MCC sold the skimmed milk by 1.60-2.20 EGP/liter according to the outlets distance and quantity. Sometimes, the MCC got extra quantity of skimmed milk from other traders, especially when the demand increased in order to keep strong relationships with all available outlets.

Social network plays an important role in this chain. MCC applied many practices to keep the relations with farmers and MCPs and to protect the enterprise, notably through participation in social events and through introducing loans in financial crisis. Also, the MCC owner provided separators scales and money for maintenance and regular visits especially in occasions to strength the social network with MCPs owners. When the demand increases, the MCC might find other sources of skimmed milk like private traders to secure the milk sourcing and engagement regarding the outlets. Moreover, one of the pillars of the MCC was the use of family labors: the MCC based on a large social network and relatives to sustain the enterprise.

Dairy Processing Units (DPUs):

According to the quantity of skimmed milk obtained through the studied MCC, two types of dairy processing units had been identified: 1) the small processing units (n= 12) that received 75.4 tons/week (45.4 % of total milk collected by the

MCC) with an average of 6.3 tons/week for each DPUs; and 2) the large processing units (n=3) that received 90.8 tons/week (54.6 % of total milk collected by the MCC) with an average of 30.3 tons/week, as shown in Table 4. Dairy processing units preferred to use skimmed milk because of its lower price compared to whole milk. Most of small processing units produce Karish cheese and white cheese (Feta, Istanboly, Baramily and Talaga; which considered as traditional white cheeses produced in Egypt from whole or skimmed milk). The main season of producing white cheese between November and May and it might be extended to July according to market demands.

Small DPUs characterized by limited technologies, a few numbers of labors (1-4 labors), with no scientific background about dairy technology, a limited equipment and production. Also, according to the cheese makers, each 100 liters of skimmed milk produces around 26-30 kg Karish cheese (26-30%). The price of 10 kg Karish cheese that sold to shops or distrusters was around EGP 100. Consumers (majority from Greater Cairo) purchased Karish cheese from shops (dairy or glossary shops) with around EGP 12-18 per kg.

Most of skimmed milk collected from villages of Beni Suef governorate and chilled delivered through the El-Reka MCC, before being transported to different outlets (small and large DPUs) in Greater Cairo as showed in Figure (4).

Table 4. Quantity of skimmed milk (tons/week), No. of dairy processing units (DPUs), percentage from total skimmed milk that MCC collected, mean \pm SD and CV % for small and large DPUs

DPU	No.	(tons/week)	% of total	Mean		
				(ton/week/DPU)	SD	CV (%)
Small	12	75.4	45.4	6.3	2.4	38.2
Large	3	90.8	54.6	30.3	3.7	12.2

DPUs: dairy processing units, SD: Standard deviation; CV: Coefficient of variance.

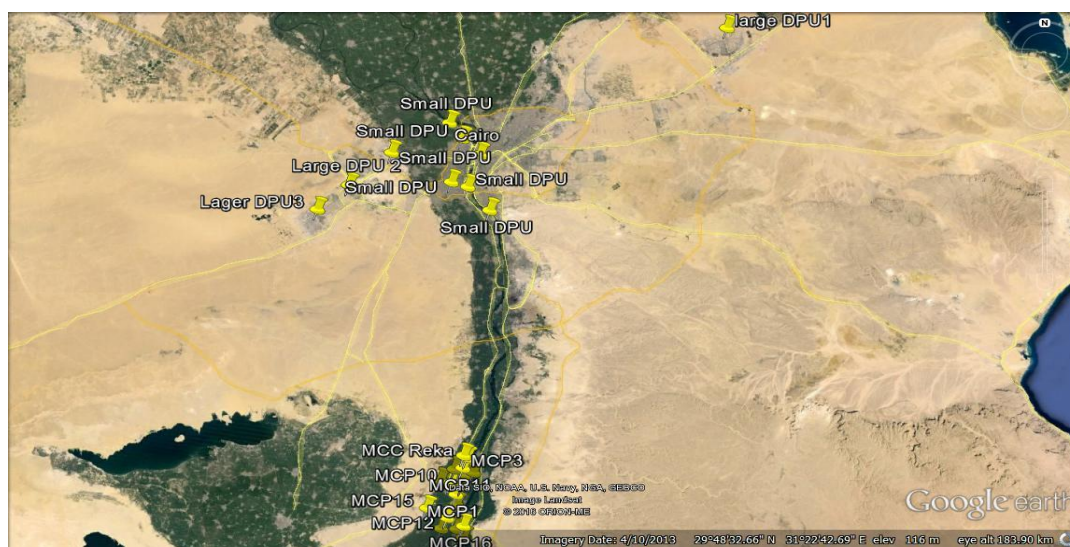


Figure 4. Map of the milk collection points (MCPs) in 16 villages, milk collection center (MCC) in El-Reka village and small and large dairy processing units (DPU). Source Google Earth scale 183.9 km.

Dynamic of skimmed milk at MCC level

MCC owner in El-Reka village had started to collect buffalo milk in 1994 with few amount of milk (20 liters/ day from relatives).

The quantity of buffalo milk increased slowly till year 2000; the amount reached 300 liters/day, when the MCC had started to collect skimmed milk (around 500 liters/day). In 2008, the collection of skimmed milk has dramatically increased to reach 5.5 tons/day. In 2015, the quantity of milk collected reached around 20 tons/day. Buffalo milk collection did not increase and still fixed with an average quantity of 500-600 liters/day. Cattle milk collected was increased and it was estimated by 3 tons in 2013 collected from three large farms (Figure 5).

There was also a dynamic trend for price. Figure 6 showed the relations between the purchasing and selling price per buffalo, cow fresh milk and skimmed milk. Buffalo milk recorded higher prices for selling and purchasing than cow and skimmed milk.

The high return% was achieved through skimmed milk enterprise. Cattle and buffalo milk enterprise achieved low return% (Figure 7). Moreover, the overall return trend of skimmed milk was going up while the trend of buffalo and cattle fresh milk was going down (Figure 7).

We can note the rapid change in skimmed milk collection by MCC at level of number of farmers, number of MCPs and quantity of skimmed milk (Table 4).

Figure (8) showed that many villages were added in 2015 which located south of MCC compared to 2013. Also, the cycle size reflects the increase of milk collection capacity in different villages through studied two years.

Moreover, in 2013 there was only one village collected more than 10,000 liters/week but in 2015 there were 3 villages collected more than 10,000 liters/week (as overall mean for three seasons). The trend of both local skimmed milk price and international powder milk price was showed in Figure 9.

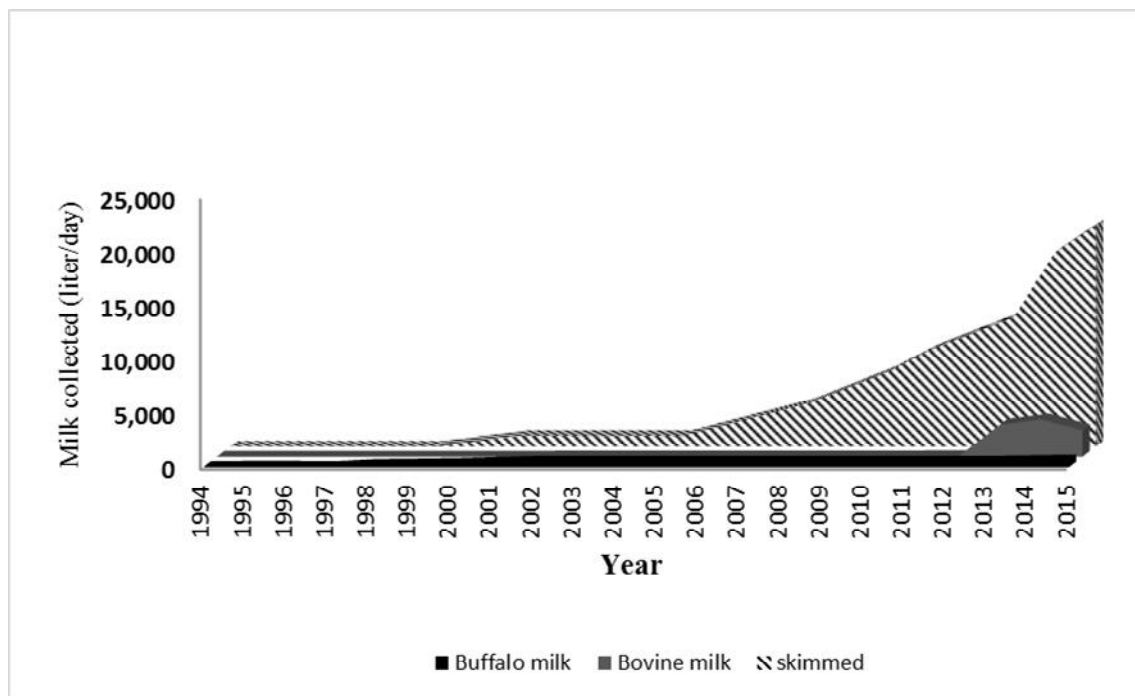


Figure 5. The evolution of collecting milk (buffalo, cattle and skimmed milk) by the milk collection center (MCC) in El-Reka village from 1994 to 2015.

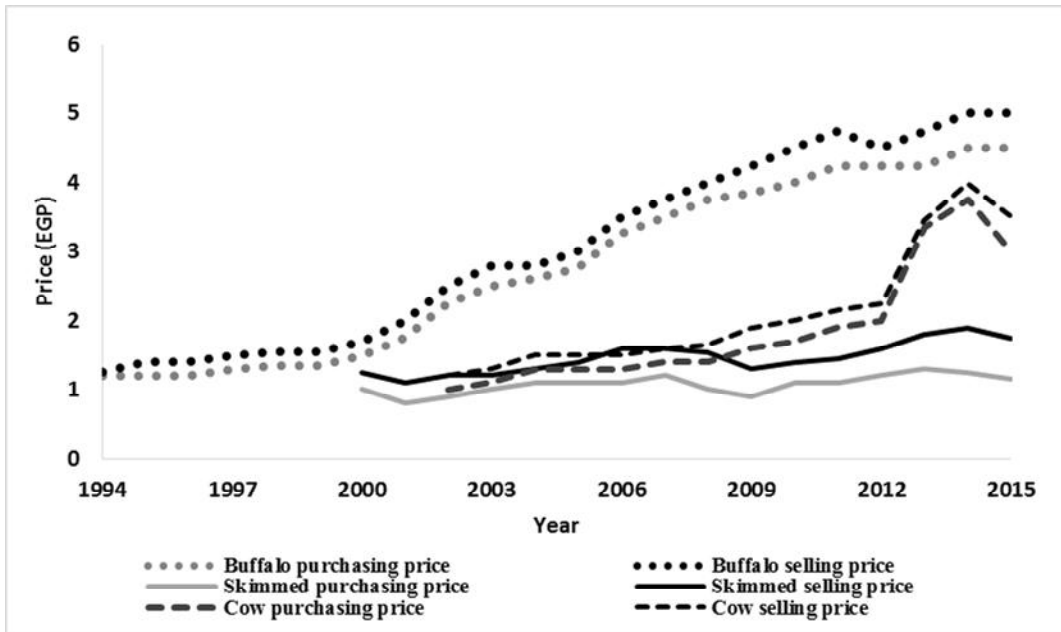


Figure 6. Development of MCC prices of purchasing and selling (LE) for buffalo, cattle fresh milk and skimmed milk during the period from 1994 to 2015

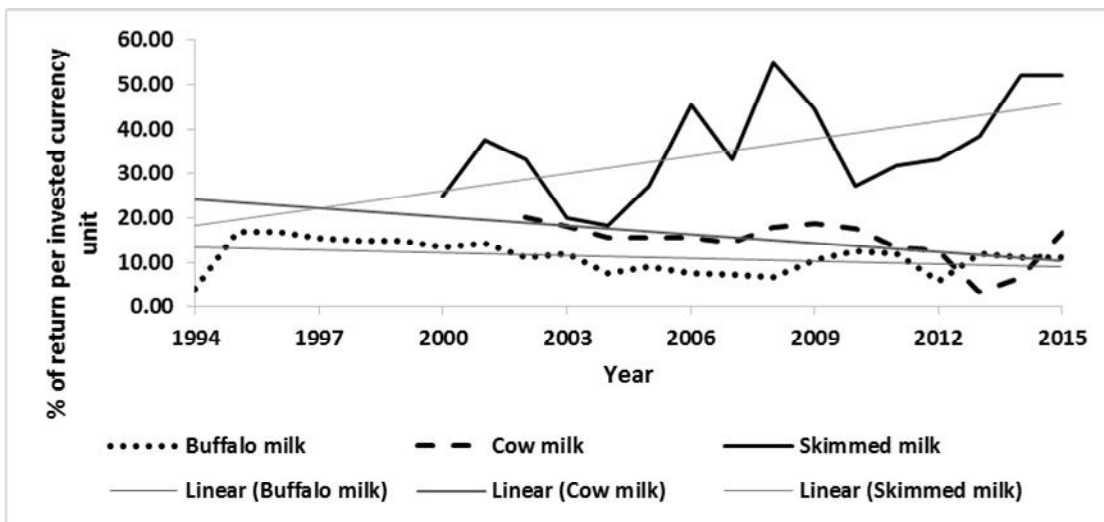


Figure 7. The percentage of return of MCC per invested currency unit (return %) for buffalo, cattle and skimmed milk during the period from 1994 to 2015

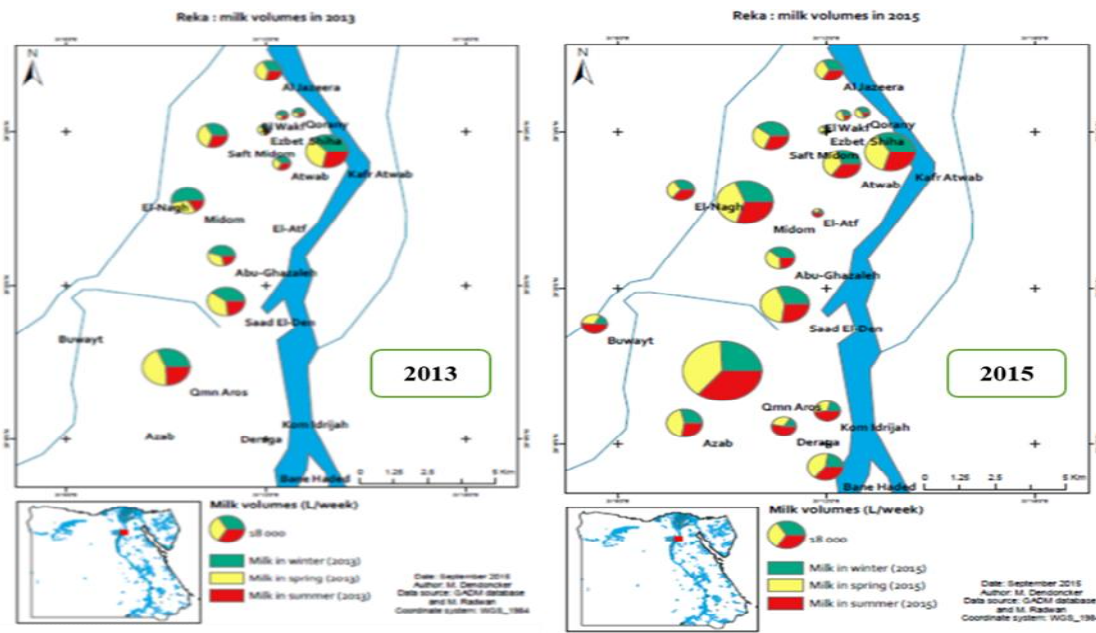


Figure 8. The location of villages that milk collection points (MCPs) deal with milk collection center (MCC) and the quantity of milk collected through three seasons in year 2013 and 2015.

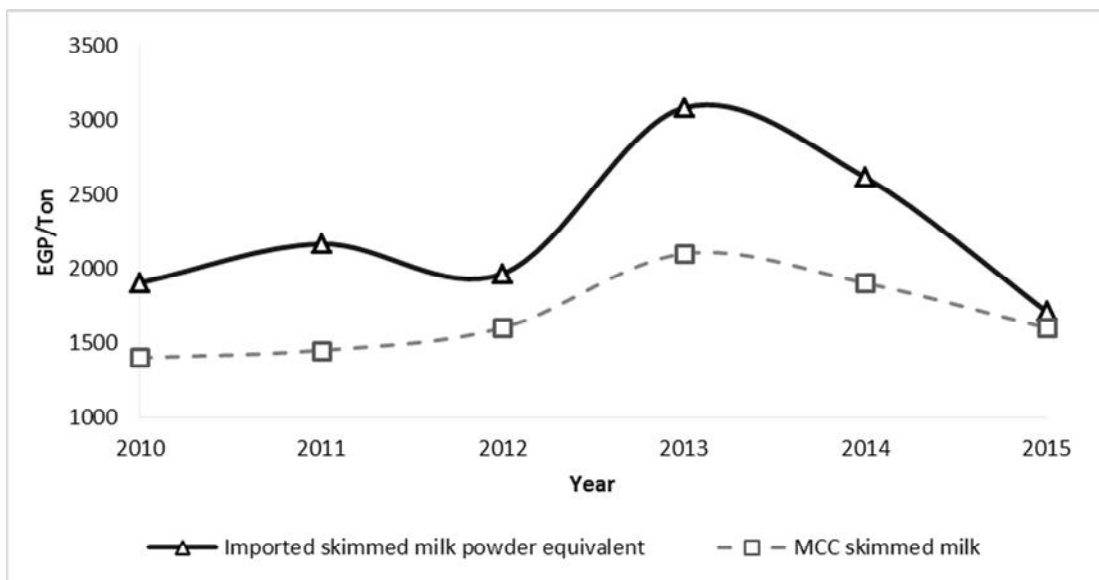


Figure 9. The change of the international price of skimmed milk powder (equivalent to liquid) and skimmed milk price for outlets linked with milk collection center (MCC) from 2010 to 2015.

SWOT analysis:

The main strengths of the studied MCC was the development of the skimmed milk chain and its capacity to increase and diversity of the actors at the sourcing (farmers and villages) and at the top (small, medium and large outlets). Social network played an important role in this chain. Also, this enterprise created one new job for each 45-55 liters. This means that this enterprise employed around 400 persons (MCC owners, labors, transporters and MCP owners).

The main weaknesses of this chain was the poor milk profitability at the farm level, and this was mainly due to the high cost of feedstuffs (concentrate feed mixture, corn and wheat bran) and the increasing cost of renting lands with limiting access. Also, poor genetic merit of animals, high costs of veterinary service and shortage of extension service were also observed during this study. Furthermore, the seasonality of milk production, as in many places over the world, remains a major constraint for the market. The percentage of sold milk over the

production was higher in spring (95.3 %) than summer (89.0 %) and winter (78.9 %) (Radwan *et al.*, 2016).

Another difficult problem was the total bacterial counts (TBC). Buffalo milk at farm level recorded the lowest TBC through the three seasons compared to skimmed milk. Also, winter season recorded the lowest TBC compared with spring and summer

seasons (Figure 10). Moreover, absence of written contracts between actors along the chain could cause unbalanced revenues or unfair pricing system, where no contracts between farmers and MCC, MCPs and MCC and outlets (in most cases they respect this kind of oral contracts). Also, the big manufactures had the upper hand on this chain. Also, no fair pricing system was developed along the chain.

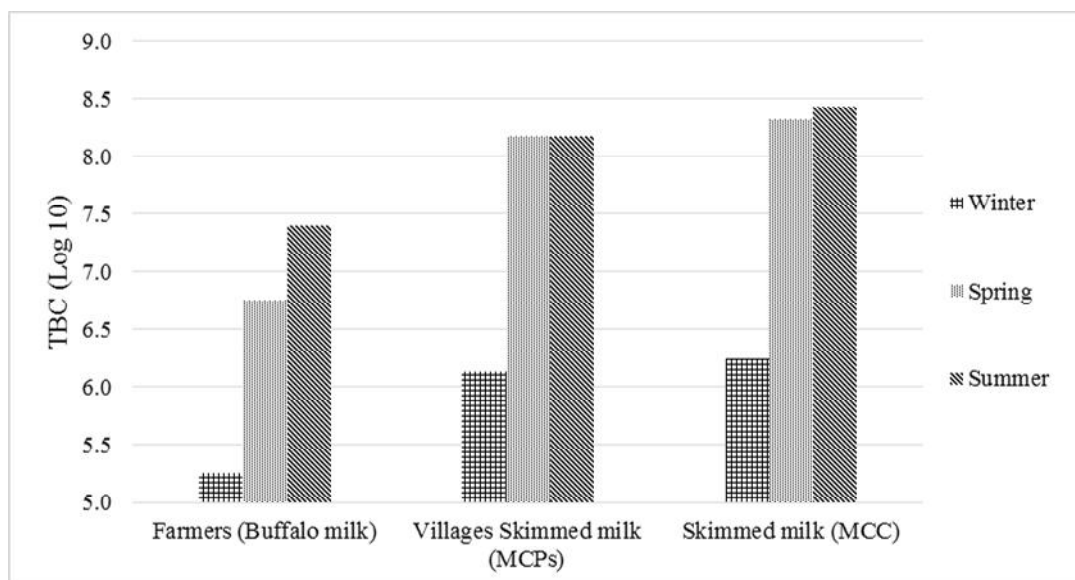


Figure 10. Total bacterial count (TBC, log₁₀) at farmer (buffalo milk), villages milk collection points (MCPs) (skimmed milk), and milk collection center (MCC) (skimmed milk tanks) through winter, spring and summer seasons.

SWOT analysis summarized the strengths, weaknesses, opportunities and threats of skimmed milk chain as following:

Weakness

- Increased the price of feedstuff and CFM.
- Lack of public veterinary services.
- Absence of livestock extension services.
- Limited cultivated lands.
- High cost of land rent.
- Low price of skimmed powder milk affecting the revenues along the chain.
- Increased TBC of skimmed milk especially in warm season.
- No contracts along the chain between actors.
- No fair pricing system especially for farmers.

Strengths

- Milk is the main source of income for farmers in studied villages.
- High dynamic chain in terms of quantity of milk, milk price and no. of suppliers and outlets
- High demand of skimmed milk
- Most links between actors in this chain based on social network.
- Skimmed milk offered with cheaper price
- Created a lot of jobs (46-55liters created one job)
- MCC can link buffalo smallholders with large plants.
- Regular quality control check by MCC.
- Provided regular income for all actors.
- Increased the demand of traditional cheese.
- Most cheese production in cold season

Threats

- Unexpected feedstuffs prices fluctuation
- Uncertainty of urbanization level at rural areas led to decrease cultivated land limited access of land
- Increase cost of rented land
- Allow the importation of dairy products without protection for national products
- Increasing costs of services introduced to farmers in terms of veterinary and extension services.
- Continuing decline in the international price of skimmed milk powder.
- Increase the level of quality standards of consumers for milk and milk products.

Opportunities

- Establish cooperatives that help farmers and provide them with reasonable price inputs and services (Ortmann, and King, 2007).
- There is a room for quality control (Figure 10).
- Ability of different actors along the chain to update chain standards (Chain Flexibility to set new standards).
- Many services can be introduced through the strong social network.

CFM; concentrate feed mixture

DISCUSSION**Skimmed milk value chain:**

There was a question why farmers preferred to sell skimmed milk than to sell whole milk or to process it. Figure (3) showed clearly the economic returns compared with the selling of cheese and butter that require more women efforts in processing with high risk for processing and marketing cheese. Indeed there is no regular demand in the local market for the milk products with an unexplained technological failing in traditional milk processing especially in summer. Moreover, the skimmed milk grown faster than buffalo or cattle milk for many other reasons: 1) higher return% of skimmed milk compared to cattle and buffalo milk as showed in Figure (7) in other words skimmed milk was more profitable for traders; 2) DPUs considered skimmed milk cheaper than cattle and buffalo milk (Figure 6); and 3) Karish cheese with low fat and Feta cheese with added vegetable oils was cheaper for the local and city markets, where most consumers are more interested by lower price than higher quality.

Moreover, the analysis of maps in Figure 4 and 8 indicated that south of Greater Cairo became an important source of skimmed milk to feed the DPUs concentrated in greater Cairo with the highest demand of dairy products in Egypt. There are two reasons that could explain this dynamic: 1) the villages in South Giza (or north Beni Suef) are far from the main fresh milk markets; so, farmers prefer to skim milk and to produce butter and cheese with more shelf life compared to fresh milk and 2) some rural farmers have always a custom, that prevent to sell milk as fresh, which considered a sign of poverty in south of Egypt.

However, the price of skimmed milk is also affected by the demand, especially from large plants which receive more than 50% of MCC milk. This demand varies with the international skimmed milk powder price that influences the national price of

skimmed milk (Figure 9). The quantity of skimmed milk sold by MCC increased when the international price increased. Therefore, skimmed milk price sold by MCC in 2015 compared to 2013 was decreased which might due to the international price decrease (Figure 9). However, the demand of cheese is also linked with the population growth. Consequently, the price depends on three main factors: the price of karish cheese (as an internal factor), the price of international powder milk (as an external factor) and the processing units demand which is directly related to the availability of milk in the market and its alternatives, mainly powder skimmed milk. The price of skimmed milk could affect the price of Karish cheese in village market due to the demand of skimmed milk. So, the external factors like skimmed milk alternatives price for cheese processing units affect indirectly the revenues of farmers and other related activities through its effect on the skimmed milk purchasing price of CPUs. Farmers are generally searching for the best price and the lowest risk. So the price offered by the MCC is a major factor for milk marketing at farm level. Generally, the owner of the MCC adjusts the price of skimmed milk according to the price of Karish cheese in village local market.

Milk quality and safety:

Total bacterial count (TBC) is an indicator for milk handling (Deepika *et al.*, 2015). The TBC increases in the hot season compared to cold season. These results were agreed with the findings of Hashmi and Saleem, (2015) (Figure 10). Whole milk contained lower TBC compared to skimmed milk collected from MCPs for each village due mainly to the absence of cooling system, the time of skimming which takes up to three hours (which lead to high multiplication of microorganisms in skimmed milk) and the time of milk collection from all MCPs for each village. Most processors consider cold season as the best period for producing high quality cheese

which match with the bacterial count in winter milk as shown in Figure (10). Establish a proper method to identify microbial contents in food chain is necessary in Egypt (Montet *et al.*, 2015).

Finally, it is observed that MCC, MCPs, and DPUs depend mainly on relatives in running the enterprises. Also, dealing with neighbors and local community build trust to guarantee the daily milk supply and milk quality. In this chain, the MCC tried to check regularly the quality and it discusses with MCPs for improving the quality of collected milk. All farmers could produce at least two types of dairy products (cheese and butter) through accumulated knowledge from one generation to another. In addition, DPUs produce many types of cheeses. The technical skills used to process the cheese was obtained from the work in large processing units or transmitted from family members.

Recommendations related to SWOT:

Many recommendations could be proposed for enhancing the skimmed milk chain. Firstly, at the farm level, many improvements can be done regarding the supply of good quality of feedstuff and CFM with reasonable price, the access to highly producing buffaloes with high genetic merits and helping farmers through training to use milk replacer for calves and applying artificial feeding to save milk. Moreover, there are a demand of training for farmers and MCP owners to produce clean milk and setting pricing system based on quality. Also, loans are required for MCPs to support cooling systems. Furthermore, Ministry of Agriculture, cooperatives and private sectors linked with Research Institutes and Universities and chain stakeholders could provide new skills, green technologies and knowledge about milk handling and processing. Moreover, this link can provide up-dated information about the weakness and opportunities and then this will help to develop more applicable research plans.

As in other regions or countries, MCC can play a crucial role to connect the small farmers to processors and provide a lot of job opportunities (Demirbas *et al.*, 2009). Moreover, MCC can use and build social relationships as a tool to extend, and to secure the enterprise. So, the El-Reka MCC as a private unit highlights a new model that can be used as a tool to improve the dairy sector, in particular in the whole traditional dairy sector. The social network in this chain needs to be deeply studied to understand the social mechanisms and how useful of these social networks at national level and in other countries that had similar production system and dairy sector.

CONCLUSIONS

In Egypt, majority of farmers consider dairy animals as the main source of regular income. Skimmed milk was highly demanded by dairy processing units. Price of skimmed milk is a major factor that affects the farmer's revenues and this price depends on the price of powder skimmed milk in the

international market and the cheese mill strategies. MCC could play a vital role in rural communities in terms of local development by allowing a good valorization of milk and in setting new quality standards. Governmental and non-governmental activities could propose new policies to protect the traditional actors along the chain. Specific dairy quality control programs should be developed along the chain. Producers were more affected by internal or external factors than intermediates. So, dairy sector instructions and rules should be reviewed to make balance along the chain and to set fair pricing system and grantee food safety for all consumers.

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REFERENCES

- Abou El-Amaiem W. E.2014. Milk Value Chain Constraints in Dakahlia Governorate, Egypt. *Epidemiol*, 4, 2165-1165.
- Awad E.I., M. A. Ibrahim, and M. I.El-Shae, 2014. Influence of probiotic on microbiological quality of kariesh cheese. *Life Sci. J.*, 11(1), 394-397. <http://www.lifesciencesite.com>.
- Bacarin E., C. B. Medeiros and E. Madeira, 2004. A collaborative model for agricultural supply chains. In *On the Move to Meaningful Internet Systems 2004: CoopIS, DOA, and ODBASE* (pp. 319-336). Springer Berlin Heidelberg.
- Bernroider E., 2002. Factors in SWOT Analysis Applied to Micro, Small-to-Medium, and Large Software Enterprises: an Austrian Study. *European management journal*, 20(5), 562-573.
- Botchkarev A., P. Andru, and R. Chiong, 2011. A Return on Investment as a metric for evaluating information systems: taxonomy and application. *Interdisciplinary Journal of Information, Knowledge and Management*, 6:245-69.
- CAPMAS, 2015. Egypt's Central Agency for Public Mobilization and Statistics. <http://www.capmas.gov.eg>.
- Deepika S.D., S. Geetha, S.K. Laxmi, B. Sri Lakshmi and M. Sulakshana, 2015. Studies on buffalo milk samples collected from different sources in Visakhapatnam. *World Journal of Pharmacy and Pharmaceutical Sciences*, 4(10), 728-740.
- Demirbas N., D. Tosun, F. Cukurand E. Gölge, 2009. Practices in milk collection centres for quality milk production: a case from the Aegean Region of Turkey. *New Medit*, 8(3), 21-27.
- El-Ramady H. R., S. M. El-MarsafawyandL. N. Lewis, 2013. Sustainable agriculture and climate

- changes in Egypt. In Sustainable agriculture reviews (pp. 41-95). Springer Netherlands. <http://www.springer.com/978-94-007-5960-2>.
- ESRI (Environmental Systems Research Institute) 2014. ArcMap 10.2.2 Redlands, California.
- FAO, 2015. FAOSTAT, FAO of the UN, Accessed on February. <http://faostat.fao.org/site/567/default.aspx#ancor>.
- Global Dairy Trade Holdings Limited, 2015 <https://www.globaldairytrade.info/en/product-results/download-historical-data/?cb=1453659514896>.
- Hashmi S. and Q. Saleem, 2015. An investigation on microbiological and chemical quality of buffalo milk supplies. Int. J. Curr. Microbiol. App. Sci., 4(1), 78-83.
- IFAD "FAO, WFP " 2012. The state of food insecurity in the world. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition." Food and Agriculture Organization of the United Nations, Rome, Italy (2015).
- Mikkelsen P., 2014. World Cheese Market Report 2000-2020. PM FOOD & DAIRY CONSULTING. 700 p.
- Montet D., A. Al Shobaky, M. T. Barreto Crespo, L. Payrastre, H. Mansour, Y. Othman, A. Morshdy, M. H. El Zayatbrahim, T. El-Arabi, A. A. Magid El-Shibiny, K. Nagy, H. Fadaly, M. A. Sorour, Y. A. Hassanien, A. R. Hassan, A. L. Abdel-Mawgood, A. Ahmed, S. Abdelghany, M. Radwan, M. Ismaiel, M. Magdy, M. Negm, A. T. Mossa, T. Heika, A. M. Abd EL-Hamid, O. El Shahaby, A. Abdu, A. Mowafy, G. Sabaa and S. Mohamed, 2015. Future topics of common interest for EU and Egypt in food quality, safety and traceability. Quality Assurance and Safety of Crops & Foods, 7(3), 401-408.
- Ortmann G. F. and R. P. King, 2007. Agricultural cooperatives II: can they facilitate access of small-scale farmers in South Africa to input and product markets?. Agrekon, 46(2), 219-244.
- Radwan M. A. S. Abdelghany, C. Corniaux, A. K. El-Asheer and V. Alary, 2016. Characterization of the diversity of dairy farming systems and milk marketing strategies around greater Cairo (Egypt). Int. J. of Adv. Res., 4(3), 686-698.
- Rome D., 2006. The future of dairy products in the Mediterranean market: specialties or commodities. EAAP publication No. 119, 11-19 pp. Santarem, Portugal, 25-27 September 2005.
- Sayin, C.M. Nisa-Mencent and S. Karaman, 2011. The roles of milk collection centers in milk distribution channels in Turkey: A case study of Antalya. African Journal of Agricultural Research, 6(1), 174-180.
- Todaro A.F. A. Adly and O. A. H. Omar, 2013. History, Processing and Quality Enhancement of Traditional Egyptian Kariesh Cheese: A Review. Food Science and Technology, 1(1), 1-6. <http://www.hrpub.org>.
- Webber C. M. and P. Labaste, 2010. Building competitiveness in Africa's agriculture: a guide to value chain concepts and applications. World Bank Publications, Washington DC 20433, 204 P. <https://openknowledge.worldbank.org>.

تحليل مواطن القوة، الضعف، الفرص والتهديدات لسلسلة إنتاج اللبن الفرز التقليدية حول القاهرة الكبرى

شريف عبدالغنى طالبة عطا الله¹، كرستيان كورنيه²، فيرونيك الارى³، محمد على رضوان⁴، آمال كمال العشييري¹

1 - قسم الانتاج الحيوانى، كلية الزراعة، جامعة القاهرة، جيزة، ج.م.ع، 2 - معهد سيراد، مونتيليه، فرنسا، 3 - سيراد / الايكاردا، الرباط، المغرب

تهدف الدراسة الى تحليل نقاط القوة والضعف والفرص والمخاطر (SWOT) لسلسلة إنتاج اللبن الفرز التقليدية حول القاهرة الكبرى. أجريت هذه الدراسة في إحدى قرى جنوب الجيزة التي تقع على حدود محافظة بنى سويف. تم إجراء تحليل SWOT بما في ذلك تناول بعض المقاييس الخاصة بسلامة الأغذية وتحليل سلسلة الإنتاج لتحديد أهم المزايا والمشاكل التي تواجه هذا القطاع. تم جمع البيانات وأخذ عينات اللبن من خلال الزيارات الحقلية المنتظمة، والمقابلات الشخصية. أوضحت النتائج الى ان العناصر الرئيسة في السلسلة وهم: الفلاحين، واصحاب نقاط تجميع اللبن، واصحاب مركز تجميع اللبن، واصحاب وحدات تصنيع الألبان. أوضحت الدراسة نقاط ضعف أخرى مثل ارتفاع أسعار مكونات الأعلاف في الأسواق، وعدم توفر الخدمات العامة من حيث أدلة الجودة والقطاعان على مستوى المزرعة. أوضحت الدراسة ان هناك حراك متزايد في هذا القطاع التقليدى وبشكل خاص في نقاط التجميع من حيث كمية اللبن التي يتم تجميعها وسعر اللبن. ومع ذلك فإن شبكة العلاقات الإجتماعية يمكن الاستفادة منها في تطوير وتقديم خدمات فعالة ومرنة والتي يمكن أن تساعد متخذى القرار والتنمويين في تحديد أولويات أنشطة التنمية المستدامة وربطها ببرامج الزراعة العالمية وزيادة الطلب على منتجات الألبان في مصر. أوضحت الدراسة أن تداول اللبن الفرز هو من الأنشطة الأكثر نمواً وجاذبية لصغار المزارعين مقارنة باللبن الكامل. اظهرت سلسلة إنتاج اللبن الفرز قابليتها للاستجابة لمتطلبات الجودة سواء أشارات السوق أوالمعايير القياسية لوحداث تصنيع الألبان. يمكن للأنشطة الحكومية والجمعيات الأهلية ان توفر الحماية اللازمة للمستفيدين على طول السلسلة الإنتاجية لهذا القطاع التقليدى. يجب تطوير برامج متخصصة في مراقبة جودة الألبان على طول السلسلة الإنتاجية. لذلك يجب إعادة مراجعة القواعد والقوانين الخاصة بقطاع الألبان حتى يتسنى أحداث توازن وتوفير نظام تسعير عادل على طول السلسلة الإنتاجية وكذلك ضمان سلامة الغذاء للمستهلكين في القرى والمدن.