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Dairy Production Value Chains of Northern and Southern Delta Egypt Governorates: Role of Milk Collection Centers (Mccs)

Sahar A. Abd El-Rahim¹; M. A. Elsorougy^{1*}; Dalia Yassin² and R. E. Hamouda¹



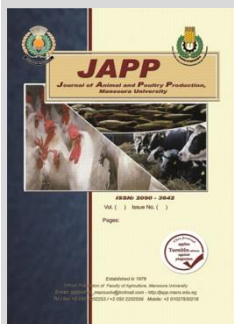
¹Animal Production Systems Research Dpt., Animal Production Research Institute (APRI), Agricultural Research Centre (ARC), Ministry of Agricultural and Land Reclaimed, Dokki, Giza, Egypt.

²Marketing Dpt., Agricultural Economic Research Institute (AERI), Agricultural Research Centre (ARC), Ministry of Agricultural and Land Reclaimed, Dokki, Giza, Egypt.

ABSTRACT

The study was conducted to analyze value chains integrated traditional and upgraded dairy production in Faiyum and Al-Sharqia governorates of Upper and lower Delta region of Egypt to identify role of Milk Collection Centers (MCCs) in providing buffalo milk at reasonable prices for consumers as well as improves income for producers. Socio-economic characteristics performance showed that most producers in the study sample were male. Education was elementary to deal with upgraded value chains where about 78.18% of producers had high education level. By the same substance, 93.64% of producers of upgraded value chain represented membership of cooperative groups. Dairy supply chain amounted 81.02% and 79.45%, 13.45% and 4.34%, 5.53% and 16.21% for sold raw milk, home consumption and processed milk of traditional and upgraded value chains, respectively. The MCCs saved around 11.10 LE for 1 kg of buffalo raw milk price at farm level delivered to the consumer compared to raw milk prices at dairy shops or even at local markets of traditional value chains, consequently adequate prices of processed product in terms of product quality. Benefit Cost Ratio (BCR) conveyed evidence prove utility of MCCs to approach highest return, accounted 4.2 LE for buffalo milk produced under upgraded value chain. Animal feed afforded by MCCs however concerned essential to reduce costs burden, impacted positively producers' income. Extension service has been reported from missions of MCCs raise awareness among producers, link decision maker to participants in developing process regarding quality and marketing of dairy products.

Keywords: Dairy Production, Value Chains, Milk Collection Centers (MCCs)



INTRODUCTION

As overpopulation concerned one of the challenges which the state facing recently, dairy production remains a magnitude alternative to raise per capita of animal protein, and as source of producers' income. National milk production recorded 3.6 million ton divided into 1.3 million ton from buffalo and 2.3 million ton from cow fresh milk (FAO-STAT, 2020). Forty five per cent of produced milk is for farm consumption, the outstanding 55 per cent is marketable for commercial in urban areas (International Labour Organization, 2020). Yet, Egypt has to import 2 million ton of milk equivalent which affect negatively national trade. Agro-industrial enterprises have initiated Milk Collection Centers (MCCs) associated to milk-sourcing project (Gold *et al.*, 2013) in responsible of Non-Governmental Organizations (NGOs) to supply processing plants and encourage local development to hosting MCCs.

Value chain determines actors donate traditional chains to provide high quality and safe product to the consumer. Therefore, characterize drives along channels in terms of factors generate value chain upgrading. Since dairy production systems of Egypt defined "family farms" (Daburon *et al.*, 2016), social and economic aspects appear crucial to identify milk quantities; its quality and bio-security. Milk Collection Centers (MCCs) are key element of supply chain to distribute produced milk to dairy plants,

arrival quality and safety product required to the consumer, however guarantee regular sale price and income for producer. Considering extension context, MCCs serve producers on technical and economic release upon their input supply. This study aims to analyze role of MCCs in order to value chain assessment to adequate product price both for producers' return and as well consumer price in lower Delta region of Al-Sharqia governorate and in Upper Delta of Faiyum governorate in Egypt.

MATERIALS AND METHODS

1. Studied area

The study was conducted from January, 2021 to December, 2021. Studied areas distinguished Delta Nile Valley region in Al-Sharqia and Faiyum governorates (Fig. 1). A total of 160 dairy producers classified: traditional (50), upgraded (110) and 35 MCCs were chosen within the studied areas. 100 producers and 20 MCCs distributed to 25 producers and 5 MCCs for each districts of Hahya, Al-Ibrahemia, Menia El-Kamh and Fakos of Al-Sharqia governorate, meanwhile 60 producers and 15 MCCs distributed to 20 producers and 5 MCCs for each districts of El-Faiyoum, Tamia and Atssa of Faiyum governorate. Informal "Traditional" systems contributed major source of fresh milk delivered to consumer. Supply chains dealt with buffalo produced milk involved small, medium producers, middle traders, wholesalers and Milk Collection Centers (MCCs).

* Corresponding author.

E-mail address: muhammadelSOROUGY@gmail.com

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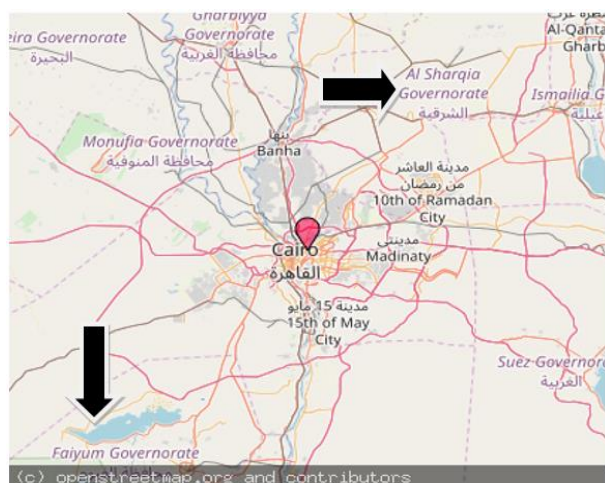


Fig. 1. The location of Al-Sharqia and Faiyum studied Governorates

2.Data collection

Stratified random sampling technique was applied to collect data. Socio-economic perspective was determined; supported data at farm community and supply chain level. Semi- structure questionnaire was designed to cover qualitative data: producer gender, producer age, occupational experience (year), education level, main occupation, labor type and co-operative group membership, and quantitative data represented both of total variable costs and milk revenue. The aim was to estimate Benefit Cost Ratio (BCR) to investigate return of participated producers.

3.Statistical analysis

Data were analyzed using SAS (2014). Chi-square procedure incorporated statistical analysis was used to test enumeration data from the field survey (Snedecor and Cochran, 1993). Linear model was designed to analyze the effect due to value chain and socio-economic characteristics as following:

$$Y_{ijk} = \mu + V_i + SE_j + e_{ijk}$$

Where,

Y_{ijk} is the total number of respondents' dairy producers,

μ is the general mean,

V_i is the fixed effect of the studied value chains,

SE_j is the fixed effect of socio-economic characteristics of respondents' dairy producers within each value chains type, and

e_{ijk} is the random error assumed to be NID (0, σ_e).

RESULTS AND DISCUSSION

1.Socio-economic characteristics of dairy producers

In general, there were significant differences between traditional and upgraded chains in socio-economic characteristics of dairy producers (Table 1).

Gender

Results in table (1) showed that male producers represented most in case study, while female percentage didn't exceed 20 %. Gender role was justified based on physical strength and gender stereotypes (UN Women, 2018 and Oxfam, 2015). Woman may help to develop in dairy value chains, particularly on rural aspect in dairy activities starting from milking phase to preparing raw milk or milk processing, selling and purchasing of dairy products.

Age and dairy experience

Age factor explained tendencies of elders to comply with traditional systems. On contrary, younger producers were more reactive to modernized procedures included

value chains. In their study on "non-progressive villages", Singh and Tygi (1985) reported that producers' age impacted adoption of innovations related dairy farms. These results are in consequence with producers' experience that the more years work in dairy activity (≥ 21 years), the more adherences to traditional itinerary (Table 1).

Education level

Education level showed main element for producers' arch to deal with upgraded value chains, for about 78.18% of the total producers had high education level (Table 1). Education considered basis to augment dairy producers' insight in terms of validation of modern technologies and production systems approach desirable product and highest farming income.

Occupation and labor type

According to results in table 1, approximately 82% of producers associated with traditional value chains work in agricultural as their main profession, while 60.91% of producers of upgraded value chains were employed another governor job beside their work in agricultural. Data indicated dependency of producers on family labor (100% in traditional, 81.82% in upgraded) in which economic factor engaged a main course of producers' breeding plan. Structures of farm labor illuminate family full-time and part time farming activity with or without extra job, and external salaried workers (Daburon, 2013).

Table 1. Socio-economic characteristics of respondents' dairy producers

Variable	Traditional Dairy Chain (n=50)		Upgraded Dairy Chain (n=110)		₂ value	Prob.
	N	(%)	N	(%)		
Gender						
Male	40	80	100	90.90	3.74	0.0531*
Female	10	20	10	9.10		
Producers' age (year)						
≤ 30	5	10	32	29.09		
31-50	8	16	69	62.73	72.80	<.0001***
≥ 51	37	74	9	8.18		
Occupational experience (year)						
Low (≤5)	0	0	5	4.55		
Medium (6-20)	16	32	92	83.63	52.78	<.0001***
High (≥21)	34	68	13	11.82		
Education level						
Illiteracy (0)	15	30	0	0		
Read and write (1-8)	10	20	6	5.45	93.83	<.0001***
Intermediate (9-11)	25	50	18	16.36		
High education (≥ 12)	0	0	86	78.18		
Main occupation						
Farmer	41	82	24	21.82		
employee	3	6	67	60.91	77.45	<.0001***
Other (free jobs)	6	12	19	17.27		
Labor type						
Family	50	100	90	81.82	10.38	0.0013***
Rented	0	0	20	18.18		
Co-operative group membership						
Yes	0	0	103	93.64	131.41	<.0001***
No	50	100	7	6.36		

***=p<0.001, and *=p<0.05

Co-operative-group membership

Dairy producers under traditional value chains weren't acknowledged role of Non-Governmental

Organizations (NGOs), wears percentage of shareholders reached 93.64% of upgraded value chains (Table 1). According to ELsorougy (2018), NGOs recommended in improving marketing systems, however, gathering purchasing inputs and decrease rely on retailers or black market hence raise producers` return.

2.Dairy supply chain

Milk produced represented sold raw milk, home consumption and processed milk (Fig. 2). Highest percentage of produced milk sold as raw by around 81.02% of traditional value chain and 79.45% of upgraded value chain. The same trend was found for home consumption (13.45% vs. 4.34%) of traditional and upgraded value chains, respectively. Dairy processing showed opposition contributed 5.53% of traditional value chain, but 16.21% of upgraded value chain. Domestic dairy production meets around 72% of demand (MALR-EAS, 2017). To fill gap between demand and supply, dairy processors and retails rely to import dairy products (around 2.2 million ton of

whole milk powder, 190.000 tons of non fat skimmed milk powder). Consumption of milk as liquid has been seen an increase in last few years, recorded 34.8% of marketable milk in urban areas. Therefore, nearby 54% of produced milk is supplied through informal sector lacks of safety and quality control. Informal milk market constitutes major source of fresh milk, where informal market channels involve small to medium producers, mobile middle traders, large wholesalers and retailers. Formal market is supplied by medium to large dairy farms passed to large dairy processors using quality indicators. Milk Collection Centers (MCCs) link informal and formal dairy supply chains adding value of processed products and quality control, responsible to balance price for consumer and rising gain to producers what indicated thought to mounting number of MCCs to stand on quantities of produced milk, particularly from small producers in a trajectory develop dairy industry considering national income.

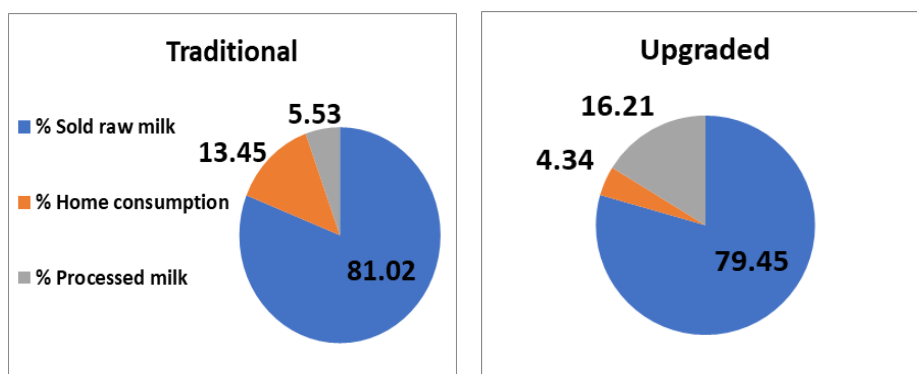


Fig. 2. Traditional and Upgraded dairy supply chains

3.Dairy value chains outcome

Value chains described the process or activities in procuring, producing and marketing of products. In fact, value chain analysis should be a critical evaluation of the chains involved, and the actors in various components of the industries and their inter-relationships. It allows the identification of the systems weak points (Porter, 1998). Value chains actors included: dairy producer, local village markets, cooperative dairy plants, dairy shop, retailer, wholesaler and consumer for both traditional and upgraded value chains. Since collection points occupied Milk Collection Centers (MCCs) and Cooperatives /private MCCs, dairy companies were included upgraded value chain.

Traditional value chain

Average buffalo raw milk price differ significantly at farm level, dairy shops or retailer and market, recorded the lowest price at farm level, the highest in shops and market price was in between (Fig.3). Sequentially, price of dairy products (*karesh* cheese, cream and butter) selling at farm level, local markets and Cooperatives/private dairy plants.

Upgraded value chain

Increase in raw milk price (from farm gate to consumer) was 1.65 LE/kg delivered from MCCs. Processed products prices for consumer decreased by 5 LE/kg of *Karesh*, however 5 LE/kg of Butter afforded by MMCs (Fig.3).

MMC's stimulate raise of producers` milk prices and improve quality of local dairy products; they act as "bridge" between producers and agribusiness (Sayin *et al.*, 2011). Faysee and simon (2015) mentioned that achieving agro-industrial quality and quantity supplies remains defect for MMCs. The authors determined defect on strategy to develop milk quality of producers delivering their products directly to the consumer without "intermediary". In urban case, agro-industrial has been recommended to invest in enterprises guarantee local milk collection and dairy products graded high quality add-value (Corniaux, 2015). It is worth recognized that gender constituent held cornerstone for MMCs projects given role of woman which may have been strengthened taking part in training, dairy manufacturing and marketing (Quisumbing *et al.*, 2013). MCCs could benefit from social anchorage in order to demonstrate adapted business argument in a process of co-construction with local milk collectors (Kelly *et al.*, 2016). Expand market channels is a key for MCCs to treat with dissimilarity of milk quality thus systems become more profitable.

BCR recorded 4.2 LE of buffalo produced raw milk of upgraded value chain in compared to 2.37 LE of buffalo produced raw milk of traditional value chain (Fig.4). Although buffalo milk is a product preference by consumer due to high fat percentage, it approaches the highest return as selling raw or processed milk.

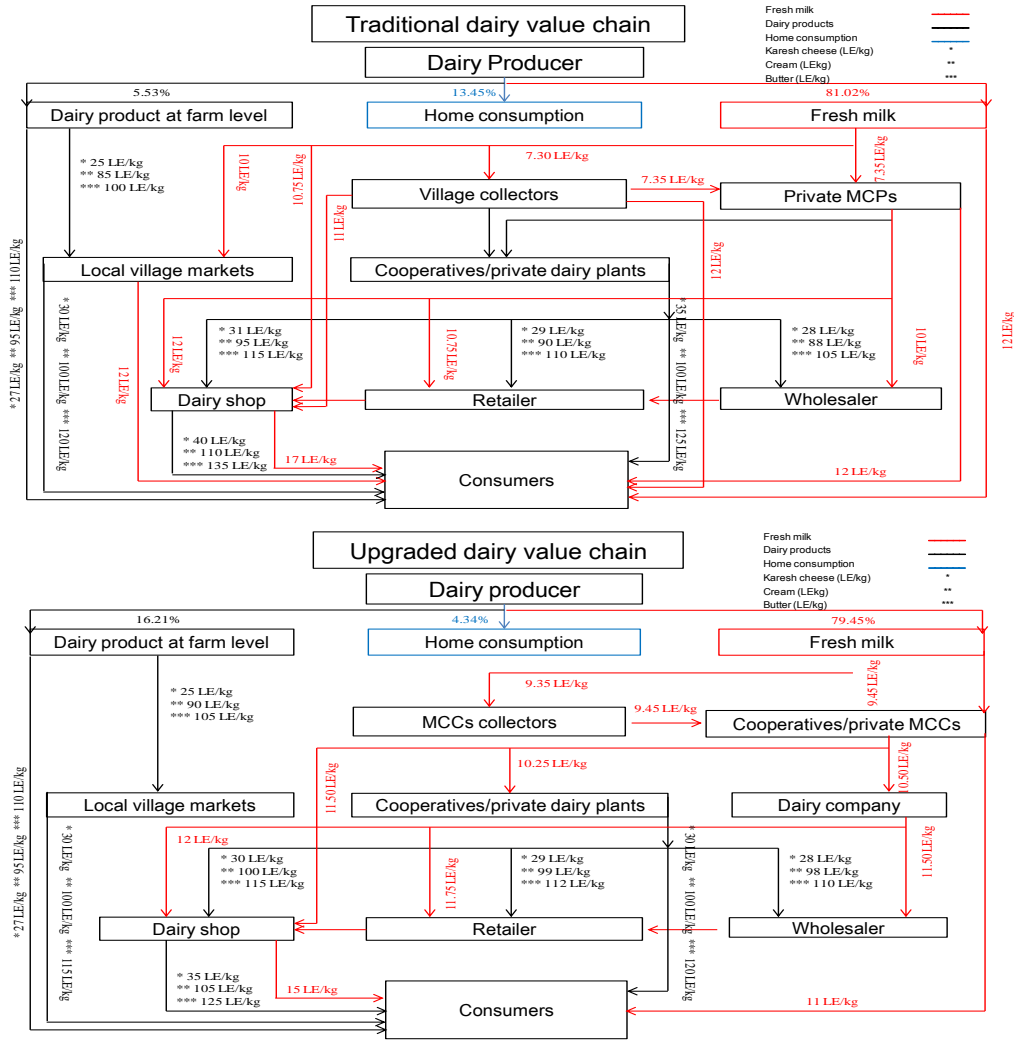


Fig. 3. Traditional and Upgraded dairy value chains.

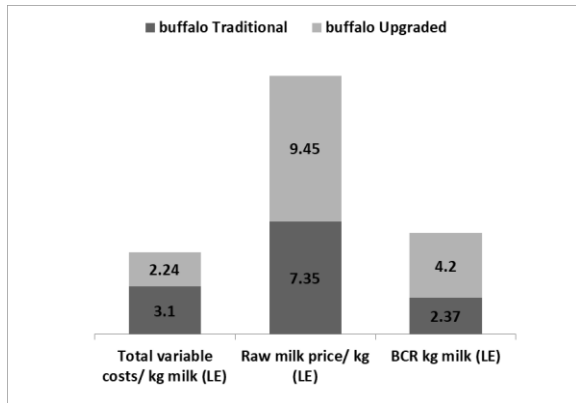


Fig. 4. BCR of buffalo Traditional and Upgraded value chains produced milk LE/kg

Upgrading influences producers' household by utilization their suppliers more efficient as well as impact from enterprises income. Upgrading can be measured by assessing productivity, efficiency and product quality. This correspond producers to participate in value chains included higher value markets and market channel. Product quality upgrading originates interaction among multiple value chain actors combines technical, social and institutional alteration (Klerkx et al. 2012). Social and organizational aspects showed extent to guarantee market- based enticement for

quality improvement, and in respecting to consumer preference. This is in accordance with what mentioned by Gereffi (2015) that upgrading product quality tends to prove vertical inter chain relationships through better logistics, contracting, communication reduce risks, and control transaction costs. Building deliberate resources investment and producers' capabilities suggested to improving producers' competitiveness (Lutz 2012). The fore mentioned supports the vision that producers' upgrading strategy based on their evaluation of risk-adjusted return, alternative opportunities, resources and capabilities, access to information and learning possibilities (Dunn et al. 2011).

CONCLUSION AND RECOMMENDATION

It became clear from the results that MCCs saved 8.05 LE (9.7 LE - 1.65 LE) for 1 kg of buffalo produced raw milk price delivered to consumers at dairy shops, and 3.05 LE (4.7 LE - 1.65 LE) at local markets compared to traditional value chain. Increase in raw milk price supplied by MCCs to Cooperatives/private dairy plants was only 0.90 LE, consequently balance prices of processed products in terms of product quality indicated necessity to largely distribute MCCs occupational area to improve local dairy industry knowing that over 1000 collection centers were initiated in Delta and Nile Valley. BCR has proven utility of

MCCs to approach highest income from buffalo produced milk for producers under upgraded value chain. Role of MCCs however included offer animal feed to producers evade brokers retail then reduce producers` cost burden. Significance of extension service has been reported; considered a mission of MCCs raise awareness among producers, link decision maker to participants in developing process regarding quality and marketing of dairy products.

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سلاسل القيمة لإنتاج الألبان في محافظات دلتا مصر الشمالية والجنوبية: دور مراكز تجميع الألبان

سحر أحمد عبدالرحيم^١، محمد أنور السروجي^١، داليا ياسين^٢ ورضا السيد حمودة^١
^١قسم بحوث نظم الإنتاج الحيواني، معهد بحوث الإنتاج الحيواني، مركز البحوث الزراعية، وزارة الزراعة وإستصلاح الأراضي، الدقى، الجيزة، مصر.
^٢قسم التسويق، معهد بحوث الإقتصاد الزراعى، مركز البحوث الزراعية، وزارة الزراعة وإستصلاح الأراضي، الدقى، الجيزة، مصر.

المخلص

أجريت الدراسة لتحليل سلاسل القيمة لإنتاج الألبان مشتملة على السلاسل التقليدية والمطورة في محافظات الفيوم والشرقية ممثلة عن منطقة الدلتا العليا والأدنى في مصر للتعرف على دور مراكز تجميع الألبان في توفير اللبن الجاموسى بأسعار مناسبة للمستهلكين وأيضا تحسين الدخل للمنتجين. بالنسبة إلى الخصائص الإجتماعية الإقتصادية، أظهرت النتائج أن معظم المنتجين في عينة الدراسة كانوا ذكورا. كان التعليم أساسيا في التعامل مع سلاسل القيمة المطورة حيث حصل حوالي ٧٨,١٨% من المنتجين على مستوى عالى من التعليم. في نفس السياق، كان ٩٣,٦٤% من المنتجين لسلاسل القيمة المطورة ممثلون كأعضاء في جمعيات تعاونية. سجلت سلاسل إمداد الألبان ٨١,٠٢% و ٧٩,٤٥% و ٤٣,٤٥% و ٥,٥٣% و ١٦,٢١% للحليب الخام المباع. الإستهلاك المنزلي والألبان المصنعة لسلاسل القيمة التقليدية والمطورة. على التوالي. وفرت مراكز تجميع الألبان حوالي ١١,١٠ جنيه للكيلوجرام من اللبن الخام الجاموسى المباع من المزرعة إلى المستهلك بالمقارنة بأسعار الألبان الخام المباعه في محلات الألبان أو حتى في الأسواق المحلية لسلاسل القيمة التقليدية. بالتالى كانت الأسعار مناسبة للمنتجات المصنعة بالنظر الى جودة المنتج. النسبة ما بين العائد إلى التكاليف كانت مؤشرا على أهميه مراكز تجميع الألبان في تحقيق أعلى عائد. مسجلة ٤,٢ جنيه للبن المنتج من الجاموس في إطار سلسلة القيمة المطورة. أيضا العلف الحيوانى الذى توفره مراكز تجميع الألبان أعتبر أساسيا لتقليل عبء التكاليف مما أثر بشكل إيجابى على دخل المنتجين. حددت الخدمات الإرشادية من مهام مراكز تجميع الألبان لرفع الوعي بين المنتجين، ربط صناع القرار بالمشركين في عملية التطوير المتعلقة بجودة منتجات الألبان وتسويقها.

الكلمات الدالة: إنتاج الألبان، سلاسل القيمة، مراكز تجميع الألبان