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ASSESSMENT OF DAIRY FARMS AND MILK COLLECTION CENTERS IN EL-GHARBIA GOVERNORATE AS A MODEL OF THE EGYPTIAN DELTA (CASE STUDY)

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SUMMARY

The current case study was conducted in El-Gharbia Governorate, Egypt, and consisted of two parts. The first part aimed to evaluate the performance of 44 dairy farms (24 in Qutur and 20 in Zefita), while the second part focused on tracing the technical and economic aspects of 17 milk collection centers (MCCs) (12 in Qutur and 5 in Zefita). Farms and MCCs were randomly selected.

The obtained results showed that cow milk production was similar in both areas, while buffalo milk production was higher among smallholders in Qutur compared to medium-scale enterprises in Zefita. Home consumption of buffalo milk reached 18% of DMY, highlighting its importance over cow milk. Factors such as land size, feed costs, and financial capability influenced farm capacity and profitability.

In medium-scale farms, holders used artificial suckling to sell buffalo milk at higher prices and sold male calves earlier due to high feed costs and market demand for veal. Calving season also affected household decisions and market supply. Artificial insemination was not applied due to high costs or lack of services.

Milk marketing depended on the distance between farms and MCCs, milk prices, transportation means, and quantities produced. The value of cow and buffalo milk was higher in Zefita compared to Qutur, buffalo milk exceeding cow milk by 34.91% in Qutur and 42.40% in Zefita, respectively.

The study concluded that expanding milk collection points, particularly under local cooperative supervision, would enable dairy farmers to increase profits by improving technical knowledge and adopting efficient hygienic practices for milk production.

Keywords: Milk collection centers, cow, Buffalo, revenues, Milk hygiene

INTRODUCTION

The Egyptian government proposed a national project to increase the number of milk collection centers (MCC) with international milk hygienist and ards, starting in January 2021. The government encouraged the current MCC to follow the international hygienist and ards by taking soft loans to rehabilitate the old MCC. Concerning the new MCC, the Food Safety Organization (FSO) proposed establishing these MCCs by putting the regulations and rules of milk production and marketing according to international standards. The Animal Wealth Development Sector (AWDS), which belongs to the Ministry of Agricultural and Land Reclamation [MALR] (2021), has recorded and followed up on all MCCs in Egypt, reaching 826 MCCs and collection points. Almost half of the existing MCCs have official licenses while the others are preparing the qualify place to get licenses.

According to statistics from the Ministry of Agriculture and Land Reclamation (MALR, 2021), the agriculture sector contributes about 13 % or nearly L.E. 285.42 billion to the Gross Domestic Product (GDP), and animal production accounts for L.E. 105.6 billion. In 2017, milk share reached almost 33% (L.E. 34.85 billion) of the total animal production. According to statistics (MALR, 2021), the population of the large ruminants was 1.4 million buffaloes, 2.8 million cattle, and 3.2 million small ruminants. The national total milk produced annually is 5.54 million tons; this quantity covers only 72% of Egypt's demand. To cover the gap between the demand and supply of milk, dairy processors and marketing channels tended to depend on the importation of milk powder and other dairy products. Egypt imported 2,255,000 tons of milk powder and 190,000 tons of non-fat/skimmed milk powder. (UN Comtrade, 2017).

Almost 75% of milk production (3.51 million tons) is produced by small traditional farms within a subsistence system in the informal sector. About 45 % of the produced milk is for home consumption, calf suckling, and dairy product processing. The remaining 55 % is marketable milk, either for local markets or urban ones. Around 34.8 % of the marketable milk is sold in liquid form, mostly from buffaloes and cows, while milk produced by sheep and goats is consumed in cheese and ghee form. Nearly 54 % of produced milk is marketed through the informal sector, which lacks safety and quality control measures (Euromonitor, 2017). Nearly 65 to 75 % of the annual milk production is produced in winter and spring seasons, where clover (green fodder) is available for animal feeding (from October to June). Around 89% of the total milk production is produced in the West Delta and Nile Valley (International Labor Organization 2020). Despite

having 44 % of dairy animals in Upper Egypt, they contribute a small proportion of the total milk production due to several factors (poor genetic makeup, improper climate, small landholdings, and inefficient supporting services). Egypt's dairy sector has both formal and informal marketing channels. In most cases, the formal market deals with medium to large-scale dairy farms that market the milk directly to large dairy processors through MCCs. While informal or traditional small-scale milk markets are considered the main outlet for smallholder dairy producers, they are also the major source of fresh milk for consumers. Informal marketing channels may include small to Medium-scale producers, moveable middle traders, wholesalers, and retailers. The informal sector of milk marketing lacks quality control and allowing only limited access of small dairy producers to the formal market (International Labor Organization 2020).

The current study aims to describe and evaluate on-farm management and productivity of milk with special consideration to the hygienic measures in the Nile Delta (part I). The study also attempts to assess the technical and economic performance of milk collection centers in the surrounding dairy farms or animal stockholders to set up the necessary measures to improve the performance of the milk collection business (part II).

METHODOLOGY

The current study consists of two parts, the first part concerns managerial practices adopted by each of the small and medium-scale animal holders, including the farmer's attitude toward milk marketing, and the second part deals with disciplines of the milk collection centers (MCC) which deal with the aforementioned animal holders.

Sampling technique and sample size:

El-Gharbia governorate is located in the middle of the delta, and was purposively selected for the present study because it is the forefront governorate in milk production and has many MCCs. Under a random sampling technique, across-sectional survey was undertaken for 44 purposively selected dairy animal households from two districts (24 from Qutur (Q) and 20 from Zefita (Z)) of El-Gharbia governorate. The target households were chosen according to their potential in dairy cattle production and the minimum holding of at least one milking cow or buffalo. The data was classified into small dairy households with five dairy animals or less (cows or buffaloes) and medium animal holdings that have more than five dairy animals. Among dairy households of the previous districts, 17 MCCs were selected, 12 from (Q) and five from(Z). The survey was conducted from November 2022 to February 2023. Two-stage purposive and random sampling technique was executed to select the research sample to reach the desired sample size in line with the study objectives. First, a sample was taken of dairy households dealing with MCCs after doing a preliminary survey in (Q) and (Z) districts. Secondly, 17 MCCs were chosen as a random sample; the selected sample size represents1% of the total dairy households and 30% of MCCs in the study area, according to the agricultural administration of El-Gharbia Governorate 2022.

Data collection method:

Two structured questionnaires were designed to collect data from dairy animal households and MCCs. The first questionnaire was designed for the house holds that raise dairy animals and sell all or part of the produced milk on their farm to MCCs directly or through middlemen. The questions of dairy animals concern productive traits and household education systems. Likewise, questions whether dairy animal householders get training to produce milk hygienically, herd management, udder care, milk marketing systems, and the milking place conditions. The second questionnaire concerning the MCCs group included questions on ownership, operation costs and revenues, quantity of daily collected milk, type of milk (Buffalo or Cow milk) physical and chemical tests before receiving milk. Also, questions about the MCC's equipment, to whom collected milk is sold, MCCs' hygiene and whether they get a license from local authorities or the Food Safety Organization (FSO). The two types of questionnaires were pre-tested among the MCC owners and dairy animal householders before starting the collection of the actual data. The pre-test step was essential to verify that all the study's objectives were met and respondents understood and answered the questions correctly.

Data analysis:

The collected data on milk production were statistically analyzed by the least squares procedure of the general linear model (GLM) of the SAS program (SAS, 2004). The degrees of significance between means were tested through Duncan's New Multiple Range Test (Duncan, 1955). The fixed model used in the analysis was:

$$Y_{ijK} = \mu + D_i + S_j + e_{ijK}$$

Where:

Y_{ijK}= is the observed traits;

μ = is the overall mean;

D_i = is the effect due to district i = 1and 2 (1 = Qutur and 2 = Zefita);

S_j = is the effect of holding capacity j = 1 and 2 (1 = smallholder and 2 = medium holder).

e_{ijk} = is a residual effect associated with the observation and is assumed to be independent and normally distributed.

Concerning the financial analysis of MCC per month, the Gross margin calculation was used as follows:

Gross margin (GM) = MCC monthly revenues- total variable costs

Gross margin (%) = (Gross margin / revenues) x 100

RESULTS AND DISCUSSION

Part I. Managerial practices of small and medium-scale farms:

***On-farm milk production and revenues of cows and buffaloes in the small and medium farms*:**

Table 1 displays data on the dairy animals raised in household or medium-scale farms that deal with MCCs in the two studied areas. The results indicated that in small dairy farms of Q, greater interest for raising dairy cows (5.01/farm) was noticed than in holding buffaloes (1.5/farm) whereas capacity in holding buffaloes (61 animals/farm) was greater than cows (43.06 animals/farm) in the medium farms of Z district. Comparing the milk productivity of each species, the total milk yield/head/lactation was relatively similar for cows of Q and Z while it was significantly higher for buffaloes of Q than of Z., this finding refers to the higher average of DMY in the small holding in Q than the medium holding in Z. In the small farms at Q, home consumption of buffalo milk attained 18% of DMY/farm denoting the importance of buffalo milk rather than cow milk for smallholders. Consequently, the quantity of buffalo milk sold in Z was considerably higher than in Q while it was similar for cow milk in both areas. Milk price per 1kg was higher by 24.5% for buffaloes and 17.9% for cows of Z than that in Q, respectively this may reflect increased demand for milk in Z especially that of buffaloes probably because Zefita is near urban areas. However, milk revenue (LE)/ buffalo head was greater in Q than Z while revenue of one cow was higher in Z than Q. This result clarifies the differences in milk prices and the impact of farm management on milk productivity in both areas. Generally, the size of cultivated land available to farmers, the availability and cost of animal feeding, and the financial capability and suitability of milk marketing channels are the main factors that govern the holding capacity and farm profitability from dairy animals. Sahar and Dalia (2017) found that the percentage of dairy buffalo holders was 20.1% and 4.37% for villages with and without MCCs, respectively.

Table 1. Characteristics of milk production and revenues of cows and buffaloes in the small and medium farms in Qutur (Q) and Zefita (Z)

Items	Small dairy farms		Medium dairy farms	
	(Q) cows	(Q)Buffalo	(Z) cows	(Z) Buffalos
Number of farms	13	11	12	8
Av. No. dairy animals/farm	$5.01^{c}\pm0.6$	$1.5^{d}\pm0.1$	$43.06^{b}\pm9.9$	$61^{a}\pm3.6$
Lactation length (day)	$266^{a}\pm2.1$	$230^{b}\pm2.6$	$266.1^{a}\pm2.3$	$217^{b}\pm4.3$
Av. Daily milk yield /head (kg)	$12.52^{a}\pm0.4$	$8.53^{b}\pm0.2$	$11.80^{a}\pm0.6$	$7.14^{b}\pm0.1$
Total milk yield /head /lactation (kg)	$3329^{a}\pm11$	$1962^{c}\pm51$	$3140^{a}\pm17$	$1549^{d}\pm42$
Av. Daily milk yield /farm (kg)	$63^{c}\pm90$	$12.8^{d}\pm1.2$	$508^{a}\pm15$	$436^{b}\pm30$
Total milk yield /farm/lactation (kg)	$16758^{c}\pm23$	$2943^{d}\pm279$	$144226^{a}\pm38$	$94512^{b}\pm758$
Av. Milk for home consumption (kg/day)	$2.8^{b}\pm0.20$	$2.3^{c}\pm0.2$	$2.9^{b}\pm0.20$	$4.0^{a}\pm0.4$
Av. Milk for home consumption (kg/lactation)	$745^{c}\pm47$	$521^{d}\pm57$	$772^{b}\pm47$	$880^{a}\pm105$
Percentage of milk for home consumption /lactation	4%	18%	4%	1%
Av. Daily milk sold (kg)	$60^{c}\pm8.9$	$10^{d}\pm1.0$	$539^{a}\pm15$	$434^{b}\pm30.3$
Total milk sold / lactation (kg)	$16013^{c}\pm23$	$2422^{d}\pm239$	$143455^{a}\pm38$	$93632^{b}\pm754$
Percentage of milk sold /lactation	96%	82%	96%	99%
Av. Milk price (L.E)/kg	$10.6^{d}\pm0.1$	$14.3^{b}\pm0.3$	$12.5^{c}\pm0.1$	$17.8^{a}\pm0.2$
Total milk revenues (L.E.) /farm	177635	42083	1802828	1682317
Milk revenues (L.E)/ dairy animal	35456	28055	41868	27579

[a-b-c-d] Means, with different superscripts, differ significantly ($P<0.05$).
Home consumption, including suckling calves and labor gifts

Education level of animal holders and training opportunities on producing hygienic milk:

The level of education and available opportunities for training on hygienic milk production of animal holders are presented in table2. In the present study, 22 dairy householders of (Q) were trained in producing clean and hygienic milk, while householders of (Z) had no training on this subject. The training sources of (Q) were different:5, 9, 5, and 3 of households trained in the MCCs, veterinary unit, cooperation between MCCs & the veterinary unit and agricultural administration, respectively. Cengizet al. (2018) reported that training is the most effective tool to produce milk with hygienic standards, adding that the level of the householder's education is also important. In this context, if farmers attend any course, the possibility of farmers' preference to sell milk to MCCs is 14 times more efficient than those not attend any training. The education level of farmers involved in this study in Q and Z districts was classified as: Ability to read and write (11 and 9), Graduates of secondary school (12 and 10), respectively and only one had a university degree in (Q) and one was illiterate in (Z). Sahar and Dalia (2017) observed that villages that established MCCs had a higher percentage of university graduates and secondary school graduates in comparison with villages not have MCCs.

Table 2. Training and education systems of animal householders

Items	Q	Z
Number of households trained on milk hygiene	22	-
Training sources for households:		
MCCs	5	-
Veterinary unit	9	-
MCCs + Veterinary unit	5	-
Agricultural unit	3	-
The education level of householders:		
Read & wright	11	9
Technical secondary school (diploma)	12	10
University degree	1	-
Illiterate	-	1

Training is the most effective tool to produce milk with hygienic standards. Not only is training important, but the level of the householder's education is also important.

Dairy animal management:

Table 3 presents some characteristics of management in the dairy farms of the studied districts. The cow drying-off period before calving was 7.9 and 10 weeks for (Q) and (Z), respectively, while that of buffalos was12.6 and 12 weeks for the same corresponding areas, respectively. This finding reflects a shortened length of the lactation period, except in cows of the (Q) area. The dry-off period is closely related to animal fertility and longevity for seasonal milk production. This period is important to maintain the physiological requirements of the pregnant animal and its mammary gland, so two months was considered ideal as a dry-off period in cows or buffaloes. Regarding the method of calf suckling, all holders adopted natural suckling except three of them used artificial suckling (Q), whereas in the Z area, all holders applied artificial suckling using cow milk for suckling buffalo calves to sell buffalo milk at high prices. The age of cow calves at weaning was almost the same in both areas. Meanwhile, buffalo calves were weaned at a higher age in (Q) than in (Z), which might be to save buffalo milk for sale at a high price. Abou-Saleh *et al.* (2017) recommended using the abrupt dry-off method for low-lactating cows (less than 10 kg milk/day) while applying irregular and incomplete milking for both medium and high-lactating cows (11-20 kg and more than 20 kg milk/day).

Animal holders in both areas confirmed that they keep female calves to upgrade the herd structure. As a commercial attitude, all holders in (Z) were selling young calves, while in (Q) the majority of farmers as smallholders (87.5%) are keeping calves, except three sell their calves. Most households sell calves at the weaning age in the studied areas to save on the cost of the expensive rations. It was noticed that holders sold cow calves earlier in (Q) than (Z) while the opposite was done for buffalo male calves. The main reason for selling calves at an earlier age might be the high cost of feeds concomitant with the great market demand for meat from veal calves. Also, the season of calving plays an important role in household decisions, market supply and subsequent demands. All animal holders stated that they don't do not apply artificial insemination (AI) mainly due to the high costs, only two farmers said that it is not available.

Table 3. Some aspects of the dairy farm management for Qutur (Q) and Zefita (Z) districts*

Districts	Q (24 holders)		Z (20 holders)		Overall
Items	Cows	Buffalo	Cows	Buffalo	
Animal dry-off period (days)	55	88	70	84	74.3
Method for drying off animal:					
Abruptly	5 (20.8%)	-----	---		11.4%
Gradually	19 (79.2%)	24 (100%)	20 (100%)	20 (100)	88.6%
Newborn calf raising					
Method of calf suckling:					
Artificial	3 (12.5%)	------	20 (100%)		52.3%
Natural	21(87.5%)	24 (100%)	---	20(100%)	47.8%
Calf weaning period (days)	83	84	84	56	76.8%
No. of farms selling young calves	3 (12.5%)	18 (75%)	20 (100%)	12 (60%)	52.3%
No. of farms keeping a young calves	21 (87.5%)	6 (25%)	---	8 (40%)	47.8%
Calf age at selling (days)	37.3	49	46.2	38.1	42.7
Animal Recording:					
No. of farms keeping records	22 (91.7%)	10 (41.7%)	20 (100%)	5 (25%)	
Constraints of AI adoption:					
High costs	22 (91.7%)	22 (91.7%)	20 (100%)	20 (100%)	95.5%
Not available	2 (8.3%)	2 (8.3%)	---		4.5%

*Managerial aspects are indicated by the number of farms and percentages (%) of farms adopting certain practices within each district.

Mastitis detection methods and Udder care:

Table 4indicatessubclinical mastitis detection methods as carried out by animal holders. All households of (Q) can detect symptoms of sub clinical mastitis in dairy animals, either by using filter papers (4) or filter cups (19), and only one uses sheath clothes as a filter. In (Z) 16 households can recognize these symptoms and use filter papers. All holders, whether of (Q) or (Z) detect sub clinical mastitis before milking their animals except one in each district. The majority of households take care of their udders to avoid milk contamination and deliver milk to MCCs without problems to avoid the rejected milk. Cengiz *et al.* (2011) found that the health of cows and feeding conditions very crucial things. Most of the producers (54.9%) believe that the most important thing is the place where cows live and their sanitary conditions. Regular veterinary controls are found to be important for 24.6% of producers.

Table (4) describes the trend of households in producing milk free from contamination through four precautionary steps: 21 households in (Q) reported udder cleaning, five households thought udder hair removal, 24 believed covering the milking cans, and 23 thought cleaning the milking place.

Table 4. Common practices of animal milking, udder care, mastitis detection and milk transport tomilk collection centers (MCC) for Qutur (Q) and Zefita (Z) districts.

Districts	Q (24 holders)	Z (20 holders)	Overall (44 holder)
Practices adopted before milking:			
Cleaning the milking area	23 (96%)	19 (95%)	42 (95%)
Removal of udder hair	5 (21%)	19 (95%)	24 (55%)
Udder cleaning by water	21 (88%)	19 (95%)	40 (91%)
Material of milking vessels:			
Plastic	3 (13 %)	1 (5%)	4 (9%)
Stainless steel	13 (54%)	19 (95%)	32 (73%)
Aluminum	8 (33%)	1 (5%)	9 (20%)
Cleaning methods of milking vessels:			
Brush	6 (25%)	18 (90%)	24 (55%)
Worm water	20 (83%)	19 (95%)	39 (89%)
Detergent	20 (83%)	19 (95%)	39 (89%)
Aluminum wire material	13 (54%)	5 (25%)	18 (41%)
Mastitis detection:			
Having knowledge about mastitis control	24 (100%)	16 (80%)	40 (91%)
Tools used for mastitis detection;			
Indicator paper	4 (17%)	16 (80%)	20 (45%)
Filter cup	19 (79%)	4 (20%)	23 (52%)
Clothes	1 (4%)	-	1 (2%)
Calling the veterinarian for mastitis treatment	23 (96%)	18 (90%)	41(93%)
Non-interest in treatment	1 (4%)	2 (10%)	3 (7%)
Means of milk delivery to MCC:			
Bicycle	1 (4%)	---	
Motorbike	13 (54%)	5 (25%)	1 (2%)
Pick-up car	2 (8%)	15 (75%)	17 (39%)
Donkeys	2 (8%)	---	2 (5%)
Small carts	6 (25%)	---	6 (14%)
Time duration for milk delivery to MCC (min.)	71	120	

Items indicated by the number of farms and percentages (%) of farms adopting certain practices within each district.

However, all households of (Z) do all the previous four steps together except one. Concerning cleaning of milking cans, most households (20) of(Q) used warm water with detergents. Thirteen out of 20 households used aluminum wire, while only 6 used a brush with warm water and detergents. The majority of holders of (Z) used a brush and warm water with detergents, while only five farmers used aluminum wire. Most of the households used stainless steel cans, followed by aluminum cans, while only three farmers of (Q) and one farmer of (Z) used plastic cans.

Animal holders of (Z) are keen to produce hygienic milk due to MCCs receiving conditions; other wise, their milk will be rejected. Most households of (Q) used motorcycles, pick-up cars, and donkey carts. Whereas, most households of (Z) used pick-up cars and Motorcycles. Milk delivery time from farms to MCCs was higher in (Z) than (Q), it might be due to the long distance and means of transportation. The average storage period of milk until sold is two hours. Methods applied to produce hygienic milk were followed by milk producers, and there is no rejected milk in MCCs at the time of the present study. It may be due to the good impact of

training in (Q) and (Z) and understanding of the important procedures to produce hygienic milk, which is reflected in the good choice of cleaning methods and milk containers.

Farmers' attitude toward milk marketing:

Table 5 presents the pathways of milk marketing in the two studied areas. Most households sold milk directly to MCCs (67% of holders in Q and 25% in Z) or through milk collectors belonging to MCCs (8% in Q and 65% of holders in Z). Only six households represent 25%of the total sold milk in (Q) to consumers, and two households represent 10% of the total sold milk in (Z) delivered to traders. The milk marketing most likely was determined according to the distances between MCCs and farms, milk price, means of transportation, and quantities of milk. Sahar and Dalia (2017) reported that 80% of farmers sell their milk to collection centers, while the other 20% sell it to wholesalers in the villages connected with MCCs. In the villages that have no MCCs, 100% of farmers sell their produced milk to middlemen. Sahar and Dalia (2017) found that about 64% of householders cool the milk before selling it to the consumers or MCCs in the village. Farmers, who are closer to the city center, prefer to market milk by themselves to get more profit. Cengiz *et. al.* (2011) and Sahar *et al.* (2022) found that the MCCs delivered raw buffalo milk to consumers at a lower price (11.10 LE/kg) as compared to raw milk prices at dairy shops or even at local markets of traditional value chains, consequently adequate prices of processed dairy product in terms of quality.

Table 5. Marketing of milk produced by farms for the Qutur and Zefita districts

Market channels and supply	No. farms	Milk collected (kg) in Q		No. farms	Milk collected (kg) in Z	
		Cows	Buffaloes		Cows	Buffaloes
Selling milk to consumers	6 (25%)	206	50	-----	-----	-----
Selling milk to Traders.	-			2 (10%)	351	222
Selling milk directly to MCCs	16 (67%)	1100	269	5 (25%)	526	334
Milk collectors belonging to MCC	2(8%)	133	34	13(65%)	2629	1668
No. holders selling milk to MCC	18 (75%)	1439	353	18 (90%)	3506	2224
Percent of milk supply to MCC (%)		83	17		54	46
Cow milk supply < 20 kg/day	2	22.2	-----	------	-----	-----
Cow milk supply > 20 kg/day	21	1365		13	7007	
Buffalo milk supply > 20 kg/day	8		1848	9		1953

Part II. Disciplines of the milk collection centers (MCC)

Description of the MCC operating system:

The results in Table 6 were obtained from 17 MCCs as samples in the studied areas. Regarding ownership of MCCs, 15 of them are private properties while only two in (Q) belong to cooperatives. The cooperatives play an important role in supporting animal holders by offering incentives or advantages such as providing animal feed at lower prices, training, and veterinary services at low cost. In (Q) and (Z), only five and three MCCs, respectively, had official licenses obtained from the local authorities.

The number of workers in MCCs was higher in (Q)than in (Z), denoting increased labor cost in (Q), probably due to greater daily milk quantities received. The majority of MCCs in (Z) received cow and buffalo milk, while those in (Q) received only cow milk. The MCCs in (Q) collect a considerable quantity of raw cow milk to be directly delivered to milk processing factories. While the MCCs in (Z) are selling raw milk either directly to consumers or dairy processing factories, only one MCC in (Z) processed the received milk into butter directly sold to consumers, so the demand for buffalo milk in (Z) is higher than in (Q). All MCCs received milk two times a day after adopting the physical and chemical tests for milk before being accepted, since the delivered milk should match to hygienic and safety standards specified by the dairy processing plant. In the (Q) specifications, the minimum requirements for cow milk include a fat percentage of at least 3.43%, a milk density between 1.026 and 1.032 g/ml, and pH level of at least 6.42. In the (Z) specifications, the fat percentage for cow milk is set at least 3.45%, while buffalo milk requires a fat percentage of at least 6.5%, with a milk density between 1.025 and 1.032 g/ml, and pH level of at least 6.38.

Seasonality of milk production was reflexed on prices that was higher in summer (dry fodder season) than in winter (green fodder season) according to milk offer and demand, also, milk price was higher in (Z) than in (Q), the price was rapidly changing according to animal feed prices. It was observed that the number of MCC expansions was faster in (Z) than in (Q) although the number of holders in (Q) was greater and the farm size was smaller in (Q) than in (Z). The MCCs are business enterprises that must be managed professionally to ensure efficiency, profitability and sustainability. Sahar *et al.* (2022) reported that the informal milk market constitutes a major source of fresh milk, where informal market channels involve small to medium producers, mobile middle traders, large wholesalers and retailers. The formal market is supplied by medium to large dairy farms, which pass to large dairy processors using quality indicators. The MCCs link informal and formal dairy supply chains, adding value to processed products and quality control, responsible for balancing prices for consumers and rising gains for producers.

Table 6. Characteristics of milk collection centers operation in Qutur and Zefita districts

Items	Q	Z
MCCs Ownership:		
cooperatives	2	-
privateproprieties	10	5
MCCs licensed by the local authority	5	3
No.Laborers/MCCs:		
Agric. Eng.	1	1.2
Accountant	1	-
Av. Laborers	3.75	2.6
MCCs collected cow milk	12	1
MCCs collected cow and buffalo milk	-	4
Cow milk price (LE/kg)	10.6	12.5
Buffalo milk price (LE/kg)	14.3	17.8
MCC payments to producers (weekly)	9 MCC's	5 MCC's
MCCs Payments to producers (monthly)	3 MCC's	-
Registration in NFSO*	5 MCC's	1 MCC's
Average daily milk received (tons)	17	7.5

*National Food Safety Organization

Table 7 present quantities and values of milk produced by holders involved in the current study and collected by MCCs in Q (24 farms) and Z (20 farms). According to data from the milk collection centers (MCCs), the amount of milk supplied by those farms represents 10.5% and 7.64% of the total milk collected daily in the Q and Z districts, respectively. It was evident that MCC in Q was characterized by the higher capacity to collect cow milk in this district in comparison with Z, however buffalo milk collected in Q was relatively less than that collected in Z. Considering prices of milk in both districts, the value of 100 kg collected cow milk in Q and Z was 1060 and 1250 LE., respectively whereas, value of 100 kg collected buffalo milk in Q and Z was 1430 and 1780 LE., respectively indicating higher values of milk of both species collected in Z than that of Q district. On the other hand, the unit value of buffalo milk was greater than cow milk by 34.91% and 42.40% in Q and Z, respectively. Since 0.5 LE is gained by MCC from the dairy planet for each kg of collected milk, the value added by collected milk in MCC of Q (255000 LE) was nearly double that of the Z district (112500 LE). Total revenues in both studied areas were 5981790 L.E. and 3473550 L.E.

Table 7. Quantities of milk collected from the sample farms in Qutur and Zefita districts

Items	Milk collected in Q		Milk collected in Z	
	Cows	Buffaloes	Cows	Buffaloes
Daily collected milk (kg)	14110	2890	4050	3450
Monthly collected milk (kg)	423300	86700	121500	103500
Value of collected milk (LE). *	4486980	1239810	1518750	1842300
Monthly revenues (LE) **	4698630	1283160	1579500	1894050
Value added by collected milk (LE).	211650	43350	60750	51750
The total value added of cows and Buffalo	255000		112500	
Total revenue for the MCC center	5981790		3473550	

*Value of collected milk = Monthly collected milk kg X market price of 1 kg received

**Estimated monthly revenues of collected milk = Value of collected milk kg + Value added by collection process

Milk collection center cost, revenue, and gross margin:

As presented in table 8, labor, water consumption, and place rent costs were higher at (Z) MCC than at (Q) MCC, whereas electricity and milk transportation costs were higher at (Q) MCC than at (Z) MCC. Overall, the total operational costs at (Q) MCC were 5.94% greater than those at (Z) MCC. These cost differences are likely associated with variations in daily milk quantities received, milk tank capacity and available equipment at each MCC. Despite the relatively small difference in operating costs, (Q) MCC generated 72.21% higher monthly revenue than (Z) MCC. This is likely due to the larger volume of milk collected daily. Therefore, the gross margin of (Q) was129% higher than that of (Z), resulting in higher percentages of gross margin and added values of MCC operation in (Q) compared to (Z). Gross margin is a key economic indicator used to assess the performance and sustainability of enterprise operations.

Table 8. Average costs, revenues, and Gross margin of the milk collection center (LE)

Items	(Q)	(Z)
MCC operating monthly costs:		
Av. Labor	13875	14100
Av. Electricity	3042	2800
Av. Milk transport to MCC	8708	6700
Av. Water consumption	1300	1340
Av. Place rent	1933	2300
Total operation costs	28858	27240
Cost of collected milk	5726790	3361050
Total variable costs (LE)	5755648	3388290
MCC monthly revenues (LE)	5981790	3473550
MCC Gross margin (LE) *	226142	85260
MCC Gross margin%% **	3.78 %	2.45%
(Value added / variable costs) * 100	4.43 %	3.32%

* Gross margin (GM) = MCC monthly revenues – total variable costs
** Gross margin (%) = (Gross margin / revenues) x 100

CONCLUSION

Milk hygiene is a vital and biological issue that starts at the farm and ends at the milk consumer. It could be concluded that the expansion of milk collection points and centers will enable dairy animal holders to get more profits through upgrading their technical knowledge of farm management and considering hygienic procedures for milk production.

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تقييم مزارع الألبان ومراكز تجميع الألبان في محافظة الغربية كنموذج للدلتا المصرية (دراسة حالة)

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أجريت دراسة الحالة هذه في محافظة الغربية بمصر، وتألفت من جزئين .إستهدف الجزء الأول إلى تقييم أداء ٤٤ مزرعة ألبان (٢٤ في قطور و٢٠ في زفتى)، بينما ركز الجزء الثاني على الجوانب الفنية والإقتصادية لـ ١٧ مركزًا لتجميع اللبن (١٢ في قطور و٥ في زفتى). تم إختيار المزارع ومراكز تجميع اللبن بشكل عشوائي . وأظهرت النتائج أن إنتاج اللبن البقرى كان متشابهًا في كلتا المنطقتين، بينما كان إنتاج اللبن الجاموسى أعلى بين صغار المزارعين في قطور مقارنة بالمزارع متوسطة الحجم في زفتى. وبلغ الإستهلاك المنزلى من اللبن الجاموسى ١٨٪ من إجمالي إنتاج اللبن الكلى، مما يسلط الضوء على أهميته مقارنة باللبن البقرى. وقد أثرت عوامل مثل مساحة الأرض وتكاليف الأعلاف والقدرة المالية على قدرة المزرعة وربحيتها. في المزارع متوسطة الحجم، إستخدام الرضاعة الإصطناعية لبيع اللبن الجاموسى بأسعار أعلى وبيع العجول الذكور في وقت مبكر بسبب إرتفاع تكاليف الأعلاف وطلب السوق على لحم البتلو. كما أثر موسم الولادة على القرارات وإمدادات السوق. ولم يتم تطبيق التلقيح الإصطناعي بسبب إرتفاع التكاليف أو ضعف الخدمات. ويعتمد تسويق اللبن على المسافة بين المزارع ومراكز تجميع اللبن، وأسعار اللبن، ووسائل النقل، والكميات المنتجة. وكانت قيمة اللبن البقرى والجاموسى أعلى في زفتى مقارنة بقطور، وقد تجاوز اللبن الجاموس اللبن البقرى بنسبة ٣٤,٩١٪ في قطور و٤٢,٤٠٪ في زفتى. وقد خلصت الدراسة إلى أن توسيع نقاط تجميع اللبن، وخاصة تحت إشراف التعاونيات المحلية، قد يمكن مزارعي الألبان من زيادة الأرباح من خلال تحسين المعرفة الفنية وتبنى ممارسات صحية فعالة لإنتاج اللبن.