SOME SALIENT FEATURES OF DAIRY FARMING UNDER THE CROP/LIVESTOCK PRODUCTION SYSTEM IN THE NILE DELTA REGION IN EGYPT

Nigm, A. A.[1]; Y. M. Mohamed[2] ; S. A. Swiefy[2]; A. M. Ahmed[3]; A. S. Tabana[4] and R. R. Sadek[1]
1- Animal Production Department, Fac. of Agriculture, Cairo University.
2- Animal Production Research Institute, Dokki, Giza, Egypt
3- Desert Research Center, Matariya, Cairo, Egypt
4. Department of Animal Production, Faculty of Agriculture, South Valley University, Qena, Egypt

ABSTRACT

The present study was carried out to identify some salient features of the dairy farming activity under the crop/livestock production system. A random sample of dairy farms was selected in four governorates (Dakahlia, Kafr El-Sheikh, Menofia and Dammiatta). Farms were monthly monitored during the agriculture years 1998 - 2000. A questionnaire was designed to collect data related to crop and livestock production activities. The collected data included farm size, cropping pattern, herd size, herd composition, herd structure, management practices and gross output. Data were analyzed using linear model procedure of SAS (1999).

In winter, green forage area was 46.7% of the total farm size, mainly cultivated with Berseem (*Triofolium axlexndrium*), while in summer, it was 44.9% and cultivated with forage maize (Darawa). In winter, cash crops occupied 53.3% of the total farm size, while it was 55.1% in summer. Herd size averaged 5.4 A.U. Dairy animals constituted 33%, growing 57% and fattening animals 10% of the total herd size. Average milk production was 1735, 1150 and 622 kg in a lactation period of 329, 302 and 267 day for crossbreds, buffalo and then Baladi cows, respectively. Calving interval was 402, 425 and 421 day for the three genotypes, respectively. The average feeding costs represented 78.5% of the total cost. Milk production represented 54% of the total farm revenues. The average gross margin was 1568 LE/farm, while it was 285 L.E per animal unit.

Keywords: Salient features, dairy farming, production system, Egypt.

INTRODUCTION

The best-known form of crop/livestock production system is when crop residues are used to feed animals and the excreta from the animals are used as nutrients for crops (Thornton *et al.* 2002). In Egypt, crop/livestock production system is dominant. More than 95% of buffalo and cattle population are maintained in farms of less than 5 feddans (Abdel-Aziz, 1992). Buffalo and Baladi cows are the most prominent ruminants in the Egyptian small-scale farms.

Egypt faces a formidable challenge in maintaining food supply to an over growing population. Therefore, efforts are focusing on developing agricultural production to bridge the gap between food supply and the growing population demands. Understanding the crop/livestock production system is an essential step for developing agriculture production. This understanding necessitates providing accurate information on this system.

The objective of this study was to identify some salient features of dairy farming activity under the crop/livestock production system in the Delta region in Egypt.

MATERIALS AND METHODS

The dairy system analysis Unit (DSAU) of Food Sector Development Program (FSDP), which is sponsored by the Ministry of Agriculture and the European Union, initiated an activity monitoring a number of dairy farms in the Delta region during the agriculture years 1998 to 2000. The objective was to obtain reliable data on production and productivity of these dairy farms. A preliminary survey was conducted in four governorates (Menofia, Dakahlia, Kafr El-Sheikh and Dammiatta) for collecting basic information through structured questionnaire to characterize crop/livestock production system in the targeted area. The information provided a rough picture of the existing conditions and constraints in the study area.

A random sample of 48 farms (12 in each governorate) has been monthly monitored. The monthly data were collected by the extension officers under supervision of (DSAU). The collected data included farm size, cropping pattern, herd structure, herd composition, animals performance: total milk yield (TMY), lactation period (LP) and calving interval (CI), and annual farm variable costs and revenues.

Animals were fed mainly on forages and crop by-products. In summer, animals were fed on wheat straw, forage maize (Darawa) and small amount of concentrates, while in winter, animals were fed on berseem (*Trofolium axlexndrium*), wheat straw, wheat bran, concentrates and maize silage. Berseem is the main green forage cultivated in the monitored farms in winter, while in summer forage maize (Darawa) was the main green forage.

Partial farm budget was calculated for each governorate for animal production enterprise. Total farm revenue was calculated by summing up milk, growing animals and fattening animals revenues. Variable costs, feeding and veterinary care costs were collected, while economical indicators for the studied governorates were calculated per animal unit (A.U.) by subtracting variable costs from farm revenues. Gross margin per animal unit was calculated by dividing farm gross margin by the number of animal units for each governorate. Animal unit was presented by Bernard and Nix (1993) as a concept employed to enable different types and age –group of livestock to be put on a common basis (1 A.U= 1 Baladi cow, 1.1 A.U = 1 crossbred cow and 1.2 A.U = 1 Buffalo).

The data were analyzed by the least squares technique using the linear model procedure of SAS (1999). The fixed-effects linear model used to analyze the studied traits was as follows:

$$Y_{ijk} = \mu + G_i + B_j + (GB)_{ij} + e_{ijk}$$

where:

Y_{ijk} is the observation; μ is the general mean, G_i is the effect due to i^{th} governorate, i= 1, 2, 3, 4. B_j is the effect due to the jth genotype, j=1, 2, 3 (buffalo, Baladi and crossbred cattle), however, Baladi was not available in both Dakahlia and Dammiatta. Therefore, interaction of governorate and

genotype was calculated on data of Menofia and Kafr El-Sheikh. $(GB)_{ij}$ is the effect due to the interaction between governorate and genotype and e_{ijk} is a random effect associated with the individual observation.

RESULTS AND DISCUSSION

1. Crop production
1.1 Farm size

The overall average farm size was 5.6 feddan per household (Table 1). It ranged from 4.9 in Dammiatta to 6.1 feddan in Kafr El-Sheikh. The estimates were comparable to that obtained by Hathout *et al.* (1996, 5.8 feddan) but lower than that reported by El-Sayes and El-Wardani (2004, 7.1 feddan).

Table 1. Average farm size in different governorates (Feddan*).

Governorate	Average farm size
Dakahlia	5.5
Dammiatta	4.9
Kafr El-Sheikh	6.1
Menofia	6.0
Overall	5.6

* One feddan is equal to 4200 m²

1.2 Cropping pattern

In winter, the green forage occupied 46.7% of the total farm size. This area was mainly occupied by berseem (*Trofolium axlexndrium)* and few plots with fodder beet. Dammiatta showed the highest percent of area cultivated with green forage (84.2%) followed by Dakahlia, Menofia and Kafr El-Sheikh (41.7%), (34.9%) and (26.1%), respectively. Cash crops occupied 53.3% of the total cultivated area. In summer, the total green forage area constituted 44.9% of the total farm size. This area was occupied with maize forage (Darawa) and few plots with sorghum (Table 2). Cash crops occupied 55.1% of the total cultivated land area. In contrast with winter, slight differences were observed among governorates in the percentage of the area cultivated with cash crops in summer. Cotton, rice, wheat, barley, beans and sugar beet were the most dominant cash crops recorded in the target areas. These findings were in agreement with Hathout *et al.* (1996), Ahmed *et al.* (2000) and El-Wardani *et al.* (2003).

Table 2. Percentage of the cash crops and green forage in the cultivated land area.

Governorate	Winter %		Summer %	
	Green forage	Cash crops	Green forage	Cash crops
Dakahlia	41.7	58.3	50.6	49.4
Dammiatta	84.2	15.8	37.4	62.6
Kafr El-Sheikh	26.1	73.9	46.7	53.3
Menofia	34.9	65.1	44.8	55.2
Overall	46.7	53.3	44.9	55.1

2 Livestock production

2.1 Herd size

The overall herd size was 5.4 A.U. It ranged from 4.9 A.U. in Menofia to 5.8 A.U in Kafr El-Sheikh (Table 3). It is noteworthy that it is almost equal to the farm size (5.6 feddans), i.e. on the average; one feddan can carry one A.U. The estimates were lower than those obtained by Hathout *et al.* (1996, 7.6 A.U.) in Delta region and El-Sayes and El-Wardani (2004, 11.1 A.U.) in Ismailia governorate.

Table 3. Herd size in different governorates

Governorate	Herd size (A.U.)
Dakahlia	5.5
Dammiatta	4.9
Kafr El-Sheikh	5.8
Menofia	5.4
Overall	5.4

2.2 Herd composition

There were three types of herds, buffalo only, cows only and mixed herds (buffalo plus cows) (Table 4). Dakahlia has the highest percentage of buffalo herds (42%) while Dammiatta and Kafr El-Sheikh have no buffalo herds. This may be due to that most of farmers in Dakahlia sell fresh milk and buffalo milk is preferred. Dammiatta showed the highest percentage of cow herds (67%) while Menofia and Kafr El-Sheikh have no cow herds. This may be due to that farmers in Dammiatta governorate are looking for high milk production. Kafr El-Sheikh showed the highest percentage of mixed herds (100%) followed by Menofia, Dakahlia and Dammiatta (92%), (50%) and (33%), respectively.

Table 4. Herd composition in different governorates.

Governorate	Buffalo herds		Cow herds		Mixed herds	
	No	%	No	%	No	%
Dakahlia	5	42	1	8	6	50
Dammiatta	0	0	8	67	4	33
Kafr El-Sheikh	0	0	0	0	12	100
Menofia	1	8	0	0	11	92

2.3 Herd structure

Three categories of animals were observed in the monitored farms, a) dairy animals including pregnant heifers b) fattening males for meat production and c) growing animals, which include growing and suckling heifers (Table 5). Menofia and Dammiatta governorates scored the highest percentage of dairy animals (47% and 46%, respectively) followed by Kafr El-Sheikh and Dakahlia 40% and 30%, respectively. Again, this may be due to that Menofia sell the high priced buffalo milk, while Dammiatta governorate process milk as dairy products. In accordance with these findings, Dakahlia showed the highest percentage of fattening animals (20%) followed by Kafr

El-Sheikh and Menofia (4% and 3%, respectively) while Dammiatta has no fattening animals. Similar trend was observed by Aboul Ela et al. (2000) and El-Wardani et al. (2003). In general, growing animals represented half the number of animals in the herd. This indicates that farmers raise their own breeding stock by themselves.

Table 5. Herd structure in the studied governorates.

Governorate	Dairy animals		Growing animals		Fattening animals	
	No	%	No	%	No	%
Dakahlia	79	30	131	50	51	20
Dammiatta	168	46	199	54	0	0
Kafr El-Sheikh	48	40	67	56	5	4
Menofia	78	47	82	50	5	3
Overall	93	41	120	53	15	7

3. Stocking rate

In winter, the share of A.U from green forage area was 0.46 feddan per animal unit, while it was 0.40 feddan in summer (Table 6). Similar trend was found by El-Shinnaway (1990), Hathout et al. (1996) and Aboul-Ela et al. (2000). The average stocking rate was 2.3 A.U/ feddan. It ranged from 2.1 in Dammiatta to 2.7 A.U /feddan in Kafr El-Sheikh. This estimate was quite higher than that reported by El-Sayes and El-Wardani (2004, 1.56 A.U.) in Ismailia governorate.

Table 6: Average area cultivated with green forage per animal unit in winter and summer

Governorate	Average forage area (Feddan)		Forage area (Feddan) / A.U		Stocking rate A.U. / feddan
	Winter	Summer	Winter	Summer	
Dakahlia	2.3	2.7	0.42	0.39	2.2
Dammiatta	3.3	1.8	0.52	0.29	2.1
Kafr El-Sheikh	2.6	2.1	0.49	0.39	2.7
Menofia	1.8	2.4	0.40	0.53	2.2
Overall	2.5	2.1	0.46	0.40	2.3

4. Lactation performance

Analysis of lactation performance in the studied area was conducted on two governorates only (Kafr El-Sheikh and Menofia) due to the lack of information on Baladi cattle in Dammiatta and Dakahlia (Tables 7 through 9). Table 7 shows ANOVA of TMY. Genotype showed highly significant effect (P < 0.0049) on TMY. Governorate and interaction of governorate * genotype showed no significant effect.

On the contrary, LP differences (Table 8) due to governorate and genotype were significant (p < 0.0001 and 0.0236, respectively). However, the interaction of governorate * genotype was also non significant. Variations in CI (Table 9) due to the three sources (governorate, genotype and interaction) were all non significant.

Least squares means (X ± SE) of TMY, LP and CI are presented in Table 10. Crossbred cows scored the highest TMY (1735 kg), followed by buffalo (1150 kg) and then Baladi (only 622 kg). These estimates explain the absence of Baladi in both Dammiatta and Dakahlia due to its poor TMY. The comparison between crossbreds and buffalo should take fat production into consideration since fat yield represents an important food security element for the small farmer in mixed crop/livestock system.

Better lactation performance of crossbreds and buffalo is due to both higher daily milk yield and longer LP when compared with those of Baladi (Table 10).

Table 7. Analysis of variance of total milk yield (TMY) in the studied area

Source of variation	D.F	Mean squares	P <
Governorate	1	9180	0.8776
Genotype	2	2134965	0.0049
Governorate * Genotype	2	39730	0.9022
Residual	140	385750	

Table 8. Analysis of variance of lactation period (LP) in the studied area.

Source of variation	D.F	Mean squares	P <
Governorate	1	152516	0.0001
Genotype	2	33923	0.0236
Governorate * Genotype	2	8998	0.3628
Residual	135	8808	

Table 9. Analysis of variance of calving interval (CI) in the studied area.

Source of variation	D.F	Mean squares	P <
Governorate	1	0.98451	0.9872
Genotype	2	6876	0.1677
Governorate * Genotype	2	3829	0.3674
Residual	111	3789	

Table 10. Least squares means and standard errors of total milk yield (TMY), lactation period (LP) and calving interval (CI) for different genotypes.

Genotype	TMY	LP	CI
Crossbred	1735±115	329±122	402±51
Buffalo	1150±638	302±90	425±73
Baladi	622±372	267±70	421±47

5. Farm budget

Milk production was the main source of farm income and generates regular cash income for the farmers. It represented 54% of the farm income (Table 11). Dammiatta governorate has the highest percentage (66%) followed by Kafr El-Sheikh (55%) while in Dakahlia and Menofia; it was only 48% of total farm income. Milk is mainly sold as fresh milk or after processing as dairy products (cheese, butter, etc.). Most of farmers raise young stock as replacement heifers or for fattening.

Table 11. Gross margin (LE) per farm in the studied areas.

Governorate	Overall	Dakahlia	Dammiatta	Kafr El-Sheikh	Menofia
Farm revenues (LE)	12702	12871	13456	12575	11905
Milk revenues (%)	54	48	66	55	48
Variable cost (LE)	11134	11568	11698	10361	10909
Feed cost (%)	79	87	76	78	74
Gross margin (LE)	1568	1303	1758	2214	996
Gross margin /A.U.	285	241	332	351	217

Beside the forage allowances supplied from the assigned cultivated area in the farm, allowances of concentrates, grain and hay were given to all animal categories. All farms purchased concentrates from market to be used in animal feeding. Feeding cost constituted 78.5% of the total cost. Menofia and Kafr El-Sheikh governorates showed the lowest feeding cost because of using maize silage. That led to decrease the amount of feeds purchased from the market. While it was higher in Dammiatta because of the low percentage of area cultivated with green forage in summer (37.4%), which led to increase the amount of, feed purchased from market (Figure 1). Similar trend was observed by Tabana *et al.*, (2000), El-Wardani *et al.*, (2003) El-Sayes and El-Wardani (2004).
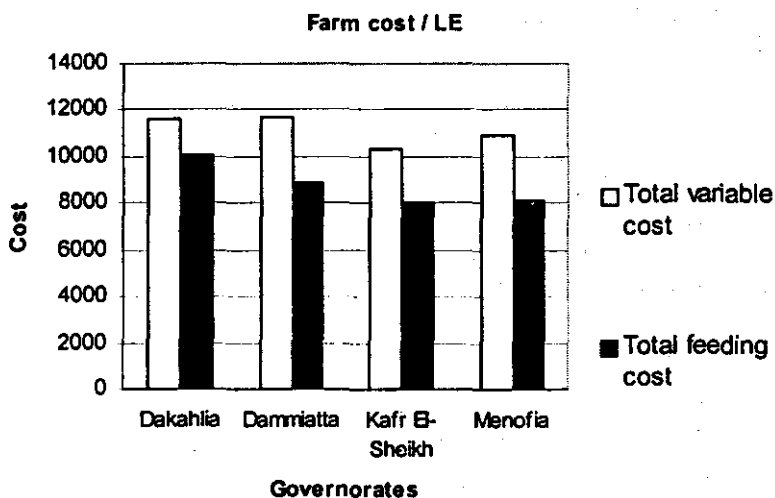

Figure 1. The average total variable cost and total feeding cost

Total gross margin per farm and gross margin per animal unit were calculated in each governorate (Table 10). The overall gross margin was 1568 LE/farm. Kafr El-Sheikh showed the highest gross margin per farm (2214 L.E) as well as per A.U. (351 L.E). Dammiatta came second scoring 1758 and 332 L.E., respectively. Both governorates had higher contribution of milk production in farm revenues. Menofia showed the lowest gross margin

(996 LE/farm). This may be due to its low milk production (988±98) and high variable cost (10909 L.E /year).

REFERENCES

Abdel-Aziz, A. S., (1992). Characteristics of Egyptian buffalo. Proc. of the International Symposium of Prospects of Buffalo Production in the Mediterranean and the Middle East. Cairo, 9-12 Nov. Egypt.

Aboul-Ela, M. B., El-Wardani, M. A. and Almahdy, H. (2000). Characterization of management practices of buffaloes raised under traditional condition of smallholdings. Animal Production in the 21st Century, Challenges and Prospects. Sakha, Kafr El-Sheikh, Egypt. April 18-20, pp 335-344.

Ahmed, A. M., Abou-Bakr, S., Sadek, R. R. and Abdel-Aziz, A. S. (2000). Appraisal of the current crop/livestock production system in a new reclaimed area operated by university graduates in Egypt. Proc. 3rd All Africa Conf. Anim. Agric.& 11th Conf. Egyptian Soc. Anim. Prod. Alexandria, Egypt, 6-9 November 2000. Pp 629-633.

Bernard, C. S. and Nix, J. S. (1993). Farm Planning and Control (2nd Ed.). Cambridge University Press, Cambridge.

El-Sayes M .F. and El-Wardani, M .A. A. (2004). Dairy farm characteristics under mixed faring system in Ismailia governorate in Egypt. Egyptian Journal of Animal Production, Vol.41, Suppl. Issue, Nov.93-102.

El-Shinnawy, M.M. (1990). The losses of feedstuffs and developing the feed resources. Proceedings of the 2nd Scientific Symposium on Animal, Poultry and Fish Nutition, 26-27 Dec., Mansoura Univ., Egypt.

El-Wardani M.A., Almahdy, H. Tabana, A. S. 'and Hathout, M.K (2000). Reproductive performance of the Baladi cows and buffaloes under traditional management system in Egyptian smallholdings. Animal Production in the 21st Century: Challenges and Prospects. Sakha, Kafr El-Sheikh, Egypt, April 18-20, pp325-333.

El-Wardani, M. A., Shalaby, T. H. and. El-Keraby, F. E (2003). Herd dynamics of medium scale dairy farms under mixed farming system in the Nile delta region. Proceeding of the 6th International Livestock Farming System Symposium Livestock Farming Systems/Product quality bases on local resources and its potential contribution to improved sustainability, 26-29th August, Benevento, Italy.

Hathout, M. K., El-Saadany, S. A. Tabana, A. S Ismail, M. M. and Gomaa, I. M. (1996). Features of dairy farming under crop-livestock mixed system in the delta region, Egypt. Proceeding of International symposium on "Buffalo Resources and Production Systems". Cairo, Egypt, Oct. 14-17, pp. 30-40.

SAS, 1999. SAS users guide Statistical Analysis System Institute, Inc., Cary, NC

Tabana, A., Van Keulen, H., Tamminga, S. and Gomaa, I. (2000). Development of decision support system for individual dairy farms in mixed irrigated farming systems in the Nile delta. Ph.D. Theses, Wageningen University, Wageningen. The Netherlands.

Thornton, P.K., Kruska, R.L., Henninger, N., Krisjanson, P.M., Reid, R.S., Atieno, F., Odero, A.N. and Ndegwa, T. (2002). Mapping Poverty and Livestock in the Developing World. ILRL (International Livestock Research Institute), Nairobi, Kenya.

الملامح الرئيسية لمزارع الألبان تحت نظام الإنتاج الحيواني و النباتي في منطقة الدلتا في مصر

علي عطيه نجم[1] ، ياسر مصطفى محمد[1] ، سويفي عبد الرحيم سويفي[2] ، علي مصطفى أحمد[3] ، أحمد سعد طبانة[4] و ربيع رجب صادق[1]

١.قسم الإنتاج الحيواني – كلية الزراعة – جامعة القاهرة.

٢.معهد بحوث الانتاج الحيواني – الدقي – الجيزة.

٣. مركز بحوث الصحراء – المطرية – القاهرة.

٤. قسم الإنتاج الحيواني – كلية الزراعة – جامعة جنوب الوادي – قنا

أجريت هذه الدراسة بهدف التعرف على الملامح الرئيسية لمزارع الألبان تحت نظام الإنتاج الحيواني و النباتي المختلط. أختيرت عينة عشوائية من مزارع الألبان في أربع محافظات في منطقة الدلتا (الدقهلية – كفر الشيخ – المنوفية – دمياط). تمت متابعة المزارع شهريا لمدة عامين (١٩٩٨–٢٠٠٠). وأشتملت البيانات التي جمعت على حجم المزرعة ، النمط المحصولي ، حجم القطيع ، تكوين القطيع ، تركيب القطيع ، نظم الرعاية وميزانية المزرعة. تم تحليل البيانات باستخدام النموذج الخطي في برنامج (SAS 1999).

كانت المساحة المنزرعة من الأعلاف الخضراء في الشتاء تمثل ٤٦.٧% من مساحة المزرعة. وكانت غالبية المساحة مزروعة بالبرسيم ، بينما كانت ٤٤.٩% في الصيف و مزروعة بالذرولة. بلغت مساحة المحاصيل النقدية ٥٣.٣% من مساحة المزرعة في الشتاء ، بينما كانت ٥٥.١% في الصيف. كان متوسط حجم القطيع ٥.٤ وحدة حيوانية. مثلت الحيوانات الحلابة ٣٣% و النامية ٥٧% و التسمين ١٠% من حجم القطيع. بلغ متوسط إنتاج اللبن١٧٣٥، ١١٥٠ و ٦٢٢ كجم في فترة حلب٣٢٩ ، ٣٠٢ و ٢٦٧ يوم للأبقار الخليطة ، وللجاموس والأبقار البلدية على الترتيب. كانت الفترة بين ولادتين ٤٠٢ ، ٤٢٥ و ٤٢١ يوم لكل من الأنواع الثلاثة على الترتيب. كانت تكاليف التغذية تمثل ٧٨.٥% من إجمالي التكاليف الجارية بينما شكل إنتاج اللبن ٥٤% من إجمالي الدخل المزرعي وكان متوسط هامش الربح ١٥٦٨ جنيه/مزرعة بينما كان ٢٨٥ جنيه لكل وحدة حيوانية.