EFFECT OF CATTLE DISEASES ON REPRODUCTIVE, PRODUCTIVE AND ECONOMIC EFFICIENCY OF DAIRY FARMS

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SUMMARY

This study was carried-out on 375 dairy cows with a history of infection with different diseases and problems that the dairy cows commonly exposed to it and 120 healthy cows free from any diseases and problems, to investigate of the effect of cattle diseases and problems on reproductive, productive and economic efficiency of dairy farms.

The dairy animals used in this study were related to 3 private farms from El-Sharkia, Cairo and Kafr El-Sheaikh Governorates during the periods from year 2002 to year 2003.

This study concluded that, the most important economic diseases and problems that affecting dairy cattle and decrease the reproductive, productive and economic efficiency of dairy farms were mastitis, lameness, tuberculosis, milk fever, endometritis and difficult calving (Dystocia) and these diseases decrease milk production by about 45.61, 43.75 , 48.10, 23.46, 29.77 and 25.83%, respectively, than the healthy animals. Meanwhile, the returns from milk sale decreased by about 44.16, 41.37, 43.27, 18.73, 25.92 and 22.53% lower than that of the healthy animals for the previous diseases, respectively.

The logarithmic production function indicated that the service per conception, days open (calving to conception), days that taken by the animals to reach its peak of production after parturation, all this reproductive parameters has a positive effect on milk production and its returns and any problems or diseases affecting the previous parameters will decrease the reproductive, productive and economic efficiency of dairy farms.

INTRODUCTION

Dairy industry plays an important role in solving the Egyptian human nutritional problem. As our population expected to reached to 74.50 million person at the year of 2005 (W.P.S.Y.B, 2003) and

each person in Egypt has an average of 16 gm from animal protein per day, which is a half of the minimum requirement for man as announced by the United Nations which is about 35 gm per day (Soliman, 1991 and Osman, 1997).

The cattle diseases are considered of the most important factors that decrease the reproductive, productive and economic efficiency of dairy farms via its effect on reproductive performance parameters which include, service per conception, calving to conception (Days open), time till the animal reach its peak of production after parturation, persistency on milk yield and lactation length. Also, cattle diseases affect the productive and economic efficiency of dairy farms via its effect on milk production , total returns and net profit. (Morris, 1977 a, b, c ; James and Ellis, 1978; ATB, 1984 ; Kirk, 1986; Grusenmyer and Hillers, 1989; Atallah, 1997; Abd El-Mola, 2003; Rizk and Bkhiet, 2003 and Zaabel and Fouda, 2003).

The most important economic diseases that affect dairy animals were classified into 7 diseases entities (from most to least) which include, mastitis, breeding `problems, gastrointestinal diseases problems, parturation problems, multiple system problems, lameness and metabolic / nutritional problems. (Kaneene and Hurd, 1990). Meanwhile, Atallah (1997) classified the most important economic diseases affecting dairy cattle under Egyptian conditions into mastitis, diseases of reproductive system, limb diseases, respiratory and digestive system diseases, skin diseases and parasitic diseases.

Meanwhile, El-Sheikh et al. (1999) concluded that the most important diseases causing severe economic losses to the farmer were mastitis and reproductive system diseases as its losses were about 3377.92 and 3213.81 LE/culled cow, respectively. Meanwhile, the lowest diseases of low costs were the digestive and respiratory system diseases as its total losses were 1639.84 and 1242.12 LE/culled cow, respectively.

Stott, 1986; DeJang, 1994 and Hamoen, 1995; they reported that, tuberculosis and foot affections are positively correlated with dairy herd life, its livability and profitability.

The foreign breeds of dairy cattle were susceptible to many diseases and problems that resulted in great economic losses to

them under Egyptian conditions as mastitis, lameness, tuberculosis and multiple system problems, milk fever, endometritis and parturation problems that decrease the reproductive, productive and economic efficiency of dairy cattle. (Bakken, 1982; Lafi et al., 1992 a, b; Samaha, 1996).
Evaluation of the success or failure of dairy farm efficiency could be detected from the presence or absence of dairy cattle diseases and its incidence in the dairy farms (Singh and Singh, 1994).

The aim of this investigation was to determine the most important diseases affecting dairy cattle under Egyptian conditions and its effect on reproductive, productive and economic efficiency parameters.

MATERIALS AND METHODS

The present study was carried-out on accurate health records with a perfect observation of the dairy cattle of 3 private farms at El-Sharkia, Cairo and Kafr-El-Sheaikh Governorates during the period extended from the year of 2002 to year 2003.

The number of cows used in this study was 375 dairy Holestein Fresian cows with a history of infection with different diseases and problems that the dairy cows commonly exposed to it and 120 healthy cows free from any diseases and problems.

The following parameters were collected and observed for studying the effect of dairy cattle diseases on reproductive, productive and economic efficiency of dairy cattle farms:-

I-Diseases types and its incidences: The diseases and problems that affecting cattle were classified into Mastitis, lameness, multiple system problems (tuberculosis), milk fever, endometritis and parturation problems according to the methods implied by Kaneene and Hurd (1990).

II-Reproductive performance parameters as:- Service per conception, calving to first service, calving to conception (Days open), time required by the dairy animal till it reached its peak of production after parturation and the lactation length period.

III-Economic and productive efficiency measures: were calculated from the total milk production, returns and profits from milk sale.

IV-Statistical and economical analysis:
a-Statitistical analysis: The statistical analysis were made according to (SAS, 1987) to study the effect of different diseases on reproductive, productive and economic efficiency parameters of dairy farms.
b-Production functions: Were made in two forms which include, logarithmic and linear pictures to study the effect of different reproductive, productive and economic efficiency parameters on total milk production and from this functions the degree of changes of total milk production and total returns in relation to changes of this parameters were calculated. According to the methods implied by Atallah (1997) and Atallah and El-Kak (1998).

RESULTS

Table 1, 2, 3 and 4 represent the results of the effect of different dairy cattle diseases on reproductive, productive and economic efficiency parameters. As well as the production functions that obtained on it and from it, the degree of changes of total milk production and total returns in relation to changes of the reproductive, productive and economic efficiency parameters were calculated.

DISCUSSION

Tables (1, 2, 3 and 4) show the significant effect of diseases that (P< 0.01) the reproductive, productive and economic efficiency of dairy cattle and dairy farms.

I-Effect of different diseases and problems on reproductive, productive and economic efficiency parameters of dairy cattle and dairy farms:-
From (Table 1) it is observed that the Service per conception (S/C) ranged from 1.88 to 2.50 service per conception for cattle that affected by mastitis and parturation problems (dystocia), and this range exceeds that of normal healthy animals in which this parameter was about 1.5 service per conception.

Meanwhile, the days open ranged from 102.75 days to 179.80 days for animals suffered from milk fever and endometritis; respectively, these periods exceeded that of normal healthy animals which needed about 90.42 days to conceive.

The animals reached to its peak of lactation in a period ranged from 22.25 to 27.2 days after parturation were affected with milk fever and endometritis, respectively, and these periods exceed the period taken by the normal healthy animals which was about (21 day) to reach the peak of lactation. Moreover, the lactation length ranged from 275.75 to 355.10 days for milk fever and endometritis, respectively, and these periods were lower than that of the normal healthy animals in which the period reached to 361.25 days.

Also, Table (1) explain the significant effect (P< 0.01) of different diseases on total milk production (Corrected total), as it ranged from 3003.95 to 4293.25 Kg, for the cattle that have a previous infection with multiple system problems (Tuberculosis) and dystocia, respectively, this range is lower than that of normal healthy animals, which had average production of 5788.85 Kg/year.

The milk returns ranged from 3085.61 to 4490.48 LE/head for the cows that were affected with diseases of mastitis and milk fever, respectively. And this range is lower than that of normal healthy animals, which reached to 5525.83 LE/head. (Table, 1).
These results agreed with those of Grusenmyer and Hillers (1989); Singh et al. (1989); Mcinerney et al. (1992); El-Ghannam (1997) and Osman (1997), they reported that the diseases of dairy cattle affected negatively the reproductive performance parameters (Service per conception, Days open, Days taken by the animal to reach the peak of lactation after parturation), also, affected milk production and the returns obtained from milk sale.

II-Degree and level of changes in reproductive parameters in relation to healthy animals due to affection of dairy cattle with different diseases and problems:-

From Tables (2 and 3) it could be concluded that the different diseases had negative effect on reproductive, productive and economic efficiency parameters.

As the increase in the service per conception due to diseases ranged from 0.38 to 1.00 with an average percentage of 25.33 to 66.66% higher than that of the normal healthy animals for mastitis and dystocia, respectively.

Days open (Days from calving to conception) in animals affected with milk fever and endometritis ranged from 12.33 to 89.38 days with an average percentage of 13.63 to 98.84 % higher than the healthy animals for the two diseases.

These results agreed with those of Williams et al. (1987); Grusenmyer and Hiller (1989), they reported that the diseases and problems affecting dairy cattle that affecting days open are the most important bottom-line indicators of reproductive efficiency of dairy cows.

Animals affected with milk fever and endometritis required more days to reach peak of lactation after parturation (1.25 to 6.2 days) compared to healthy animals.

Lactation length was decreased with about 6.15 to 49.71 days with an average percentage of 1.70 to 41.44% lower than that of the normal healthy animals. Moreover, the total production decreased in a range of 1358.35 to 2784.9 Kg with an average of 23.46 to 48.10% than the healthy animals for the problems of milk fever and multiple system problems (Tuberculosis), respectively.

Accordingly the total returns decreased in a range between 1035.35 to 2440.22 LE/cow / year with an average percentage of 18.73 to 44.16% lower than the normal healthy animals for the diseases of milk fever and mastitis, respectively. These results agreed with those of Lafi et al. (1994 a, b) and Hamoen (1995a, b), they reported that mastitis caused severe economic losses to the dairy farms via decrease of milk production and milk returns.

III-Production function of reproductive, productive and economic efficiency parameters (Independent variables) and milk production (dependent variable):-

The production functions were made in two forms, linear and logarithmic form, to study the effect of different parameters affecting reproductive, productive and economic efficiency (Independent variables) on total milk production (Dependent variable).

The best form was the logarithmic production function that cleared in the following form:-

LOG TP = 1.67 5.38 LOG SC + 3.13 LOG CS 1.84 LOG DO			
+ 3.15 LOG PEK + 5.15 LOG LL			
t-value (- 0.087)*		(0.367)*	(- 2.560)**
(2.848)*** (4.830)*			
R^{-2} = 0.98		F= (6.32)***	
Total elasticity			4.21

* Significant at (P < 0.05) ** Significant at (P < 0.01)
*** Significant at (P < 0.001)

From this equation it could be concluded that increasing of the service per conception (SC) by 1% causes decreasing of total milk production (TP) by about 5.38%, and increasing the calving to first service (CS) by about 1% causes increasing of milk production by about 3.13%, increasing of the calving to conception (days open) (DO) by about 1% causes decreasing of the total milk production by about 1.84%, and increasing the days till the animal reach to the peak of lactation (Pek) by 1% causes decreasing of total milk production by about 3.15% but the increasing of the lactation length (LL) by about 1% causes increasing of the milk production by about 5.15%. These results agreed with those of Stone et al. (1966), they showed that for each 1% increase in lactation length there was increase of 100 pounds of milk per lactation.

Also, the logarithmic production function explains that the service per conception, days open, calving to conception, days which the animal need to reach the peak of production and the lactation length explain about 98% from the changes that occur in the milk production and any affection of these parameters will affect negatively the milk production and economic efficiency of the dairy farms.

Also, the previous equations explain the changes of all previous parameters by about 1% in the same time cause increasing of milk production by about 4.21%

IV-Economic losses resulted from changes of reproductive and productive parameters due to diseases affecting dairy cattle:-

From Table (4) and the production function it could be concluded that, the losses due to increasing service per conception by 1% cause losses of milk production in a range of 136.27 to 358 Kg for mastitis and difficult calving , while the milk returns will be decreased in a range of 133.54 to 355.04 L.E for the same previous disease; respectively.

Increasing of calving to conception by about 1% causes decrease of milk production in a range between 25.07 to 181.86 kg and the milk returns will be decreased by about 25.32 to 180.04 LE for the diseases of milk fever and endometritis, respectively (Table 4). These results agreed with those of Abd El-Mola (2003) who reported that, endometritis causes severe economic losses to dairy farms via decreasing milk production and returns.

Also, the days taken by the animal after parturation to reach the peak of production if decreased by about 1% than the normal healthy animals, it cause decrease of future milk production by about 5.54 to 92.98 kg and the milk returns will be decreased by about 5.76 to 92.05 LE for the diseases of tuberculosis and endomeritis, respectively (Table, 4). These results agreed with those of Hussain and Daniel (1991); El-Ghannam (1997) and Rizk and Bkhiet (2003), they indicated that, the endometritis causes severe decrease in milk production and returns.

The lactation length if decreased by about 1% , causes decrease of milk yield by about 8.75 to 213.41 Kg and decreases of milk returns by about 8.66 to 209.14 for diseases of endometritis and mastitis, respectively (Table 4).

These results agreed with those of Adamowicz et al. (1986); Holmann et al. (1984) and (1987) and Grusenmyer and Hillers (1989), they reported that any diseases or problems affecting service per conception, calving to 1st service, calving to conception days till the animal reach the peak of production and lactation length will decrease milk production and its returns and decrease reproductive, productive and economic efficiency of dairy farms.

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parameters among different diseases affecting dairy cattle.

Diseases	No of dairy cows	Reproductive, productive and economic parameters					
		Service per conception (Service)	Calving to conception (Days open) (Day)	Days to reach peak of production	Lactation length (Day)	Total milk production (Corrected) (Kg)	Milk returns (L.E)
		-	-	-	-	-	-
Healthy animals	120	F	G	E	A	A	A
Mastitis	118	E	D	C	D	F	G
Lameness	120	C	C	D 168	E	E	E
Tuberculosis	8	B	E	C	G	G	F
Milk fever	25	B	F	D	F	B	B .85
Endometritis	43	D	A	A	B	D	D
Difficult calving	61	A	B	B	C	C	C

Means within the same column carrying different letters are significantly different at (P< 0.01)

productive and economic parameters among different diseases affecting
dairy cattle in comparison with the normal healthy animals.

Diseases	No of dairy cows	Reproductive, productive and economic parameters					
		Service per conception (Service)	Calving to conception (Days open) (Day)	Peak of productio n (Day)	Lactation length (Day)	Total milk production Corrected (Kg)	Milk returns (L.E)
		—	—	—	—	—	—
Mastitis	118	F	D	C	D	B	A
Lameness	120	D	C	D	C	C	C
Tuberculosis	8	B	E	C	A	A	B
Milk fever	25	C	F	E	B	F	F
Endometritis	43	E	A	A	E	D	D
Difficult calving	61	A	B	B	F	E	E

Means within the same column carrying different letters are significantly different at (P< 0.01)
N. B.: Data of this table calculated from table (1).

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Table (3): Percentage of increasing of different reproductive, productive and economic parameters among different diseases affecting dairy cattle in comparison with the normal healthy animals

Diseases	No of dairy cows	Reproductive, productive and economic parameters					
		Increasing service per conception from healthy %	Increasing calving to conception (Days open) from healthy %	Increasing of days to reach peak of production from healthy %	Decreasing lactation length from healthy %	Decreasing total milk production from healthy %	Decreasing of milk returns from healthy %
Mastitis	118	25.33	50.24	16.57	41.44	45.61	44.16
Lameness	120	29.33	53.45	13.28	14.26	43.75	41.37
Tuberculosis	8	36	42.33	17.61	27.45	48.10	43.27
Milk fever	25	33.33	13.63	5.95	23.66	23.46	18.73
Endometritis	43	26.66	98.84	29.52	1.70	29.77	25.92
Difficult calving	61	66.66	74.46	28.14	11.65	25.83	22.53

Data of this table calculated from table (1) and table (2).

Table (4): Effect of changes of different reproductive, productive and economic parameters (by about 1%) among different diseases affecting dairy cattle on milk production and returns of dairy cattle.

Diseases	No of dairy cows	Reproductive, productive and economic parameters				
		Increasing service per conception	Increasing calving to conception	Increasing of days to reach peak of production	Decreasing lactation length	Decreasing total milk production
Mastitis	Decrease production (Kg)	136.27	92.44	52.19	12.81	213.41
	Decrease returns (L.E)	133.54	90.59	51.14	12.55	209.14
Lameness	Decrease production (Kg)	157.79	98.34	41.83	1.50	73.43
	Decrease returns (L.E)	156.21	97.35	41.41	1.48	72.69
Tuberculosis	Decrease production (Kg)	193.68	77.88	5.54	2.92	141.36
	Decrease returns (L.E)	201.42	70.99	5.76	3.03	147.01
Milk fever	Decrease production (Kg)	179.31	27.07	18.74	13.10	121.84
	Decrease returns (L.E)	181.10	25.32	18.92	13.23	123.05
Endometritis	Decrease production (Kg)	143.43	181.86	92.98	23.12	8.75
	Decrease returns (L.E)	141.99	180.04	92.05	22.88	8.66
Difficult calving	Decrease production (Kg)	358.63	137.00	88.64	17.24	59.99
	Decrease returns (L.E)	355.04	135.63	87.75	17.06	59.39

Data of this table calculated from table (3) with the production function.

الملخص العربى
تأثير أمراض الابقار على الكفاءة التناسلية والانتاجية والاقتصادية
لمزارع انتاج الالبان

سند طلعت عطاالله

قسم رعاية الحيوان – كلية الطب البيطرى – جامعة الاسكندرية

أجريـت هـذه الدراسـة على سجلات عدد 375 بقرة فريزيان ذات تاريخ للاصابة ببعض الامراض والمشاكل التى غالبا مايتعرض لها الابقار فى مصر وعدد 120 بقرة سليمة لـم تتعرض لاية مشاكل أو أمراض . وذلك لدراسة مدى تاثير الامراض والمشاكل المرضية الـتى تـتعرض لهـا الابقـار تحـت الظـروف المصرية على الكفاءة التناسلية ، والانتاجية والاقتصـادية لمزارع انتاج الالبان. وقد استخدمت فى هذه الدراسة ثلاثة مزارع تابعة للقطاع الخـاص من ثلاث محافظات مختلفة هى الشرقية ، القاهرة ، كفر الشيخ فى فترة زمنية ممتدة من عام 2002 حتى عام 2003.

أوضـحت هذه الدراسة أن أهم الامراض والمشاكل المرضية التى تصيب الابقار وتؤثـر علـى الكفاءة التناسلية والانتاجية والاقتصادية لمزارع انتاج الالبان هى على التوالى الـتهاب الضـرع ، العـرج ، الامراض التى تصيب أكثر من جهاز فى الجسم كالسل ، حمى اللبـن ، التهاب الرحم ، عسر الولادة حيث أن هذه الامراض والمشاكل تسبب نقص فى انتاج اللبـن بحوالى 45.61 ، 43.75 ، 48.10 ، 23.46 ، 29.77 ، 25.83% على التوالى عـن الحيوانات السـليمة التى لم تتعرض للاصابة بالامراض وبالتالى نقص العائد من انتاج اللبـن بحوالــى 44.16 ، 41.37 ، 43.27 ، 18.73 ، 25.92 ، 22.53 % عـن الحيوانات السليمة للامراض السابقة على التوالى.

أوضـحت دالة الانتاج اللوغاريتمية أن عدد التلقيحات اللازمة لحدوث الاخصاب ، الفـترة من الولادة حتى أول تلقيح ، الفترة من الولادة حتى أول تلقيح مخصب ، الفترة التى تأخذهـا الـبقرة حـتى تصل الى أعلى انتاج لها بعد الولادة هى أهم العوامل التى تؤثر تأثيرا ايجابـيا قويـا على انتاج الالبان وأربحية مزارع انتاج الالبان و أن أية مشاكل مرضية تؤثر علـى العوامـل السـابقة سـوف تـؤدى الى نقص انتاج اللبن وسوف تقلل الكفاءة التناسلية والانتاجية وبالتالى الكفاءة الاقتصادية لمزارع انتاج الالبان.

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