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Impact of Some Factors on Profitability of Sheep Farms Under Egyptian Conditions

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Abstract

The aim of this study was economic evaluation and investigation of some factors such as season and demographic characters (manager characters) on some productive and reproductive efficiency in sheep production farms under Egyptian conditions. Data were randomly collected from commercial sheep farms from different localities in Menofia governorate located in the south of Nile delta in Egypt. The data included seasons grouped into (cold season) extended from 21 September to 20 March and (warm season) from 21 March to 20 September to determine its effect on birth weight, litter size and kidding interval. The data were collected, summarized and analyzed by statistical computer program (SPSS/PC, 16). The results of the study revealed that warm season had higher parameters for birth weight, litter size and kidding interval than cold season as recorded 2.91 kg, 1.61 and 9.13 months. The manager characters has a significant effect on production of sheep farms as about 31% in production changes were attributed to the changes in demographic characters such as educational level and age of producer.

Keywords: *Sheep production farms, manager characters, economic losses*

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INTRODUCTION

In developing countries, sheep is considered as an important livestock species due to their grazing habits and their ability to grow on plants that are not eaten by other livestock species (Odunsi et al., 2005) [1].

Sheep provide enough meat quantity for household consumption so considered as poor man's cow [2]. Small size farmers can earn supplementary income by small ruminant production [3].

In Egypt, the total sheep population is 4,200,000 heads and contributes 6% of the total red meat produced. Rahmani, Ossimi, and Barki are the main breeds in Egypt [4].

Egyptian sheep are subtropical fat-tailed sheep characterized by ability to breed all year round and satisfactory fertility, but have low prolificacy and growth rate [5]. Farm animal growth traits are determined not only by an animal's genetic potential for growth but also by permanent and temporary environmental effects [6].

Sheep producers strive to maximize profitability of the flock through increase in flock productivity which is a complex trait and is related to ewe productivity. Fertility prolificacy, lamb survival and lamb weaning weight are the main factors that determine both flock and ewe productivity. All of these factors may be affected by flock characteristics such as breed type and ewe age as well as management [7].

The environmental conditions often result in seasonal variation in meat prices. In the semi-arid regions, where a large proportion of sheep is located, there is a large difference in the availability of feed amount between seasons. Therefore, during the dry seasons producers are forced to reduce the total number of animal units due to feed shortages. This creates an excess supply that in turn causes a decrease in prices [8].

Management skills and production systems become more sophisticated, and this is one of the most serious constraints in achieving higher production rates. There is a special need for

training and technology transfer that would cover all aspects of production management [9].

Lack of skilled labor is often the main cause of lack of improvement in the productivity of sheep. Most of the labor is provided by the family. The person responsible for the day-to-day care varies widely depending on the production system (extensive or intensive), the number of animals, cultural factors, and other reasons. Young children usually take care of small or backyard flocks and the role of women varies considerably according to the country, region, ethnic groups, etc. As they not only take care of the animals but also own them and market them in many places [9].

If the farm includes crops, sheep production would be affected by seasonal labor especially during planting and harvesting as available labor is used in the fields. There is empirical evidence that sheep production in certain regions is very sensitive to price and weather condition changes [10].

Different sheep breeds evolved a variety of reproductive strategies to suit the wide range of environments developed. Increased body temperature can lower ewe's reproductive rate by decreasing ovulation rate, increasing embryonic mortality or by delaying heat cycles [11].

MATERIALS AND METHODS

Study Area

The data for this study were obtained from ten (10) large commercial sheep farms at Menofia province during period extended from January to December 2017 on random samples of sheep farms. Menofia is an Egyptian province in the south of the Nile Delta and located north of the Egyptian capital Cairo; its capital is Shebeen El-Kom city. About half of the province area is located in between the two branches of the Nile, so the main economic activity in the province is agriculture due to the fertile soil and abundant water for irrigation.

Data Collection and Classification

The data for this study were collected from commercial sheep farms at Menofia province from a cross-sectional and longitudinal field survey. The data were collected by two methods from the accurate records and from the structured questionnaire method established by the researcher [12]. Sheep flocks were visited twice at least, once in summer and the other in winter along the course of study.

The data were classified according to season of kidding into warm season that extended from "21 March to 20 September" and cold season that extended from "21 September to 20 March" [13].

The collected data were classified into different parameters to evaluate the productive and economic efficiency as follows:

Production and Managemental Data

- Production season.
- Litter size and birth weight/kg.
- Types and amount of feed consumed per year.
- Age at first kidding and kidding interval.
- Demographic information (owner age, education level).

Financial Data

Costs of Production

Fixed Costs (TFC): It includes the costs of depreciation of sheep, buildings, equipment and machines. The depreciation rate was calculated for the building as depreciated within 25 years and equipment and machines within 5 years. The animal depreciation was calculated by straight line method according to the useful productive life "years" [12, 13].

Variable Costs (TVC): Included the costs of drugs, vaccines, disinfectants, veterinary supervision, feed and concentrates cost, semen cost, labor cost, and other miscellaneous costs.

Returns

Included the total returns (TR) from sales of meat, newborn added to the flock values or sales, animal and manure according to the market prices during the study period. The net returns (NR) were calculated by the following equation:

$$\mathbf{NR = TR - TC}$$

Statistical Analysis

The data were collected, summarized and analyzed using (SPSS/PC, 2016) computer

program to test the effect of some factors such as season and labor on profitability of sheep farms using t-test to compare the means. Data were expressed as means and standard errors.

RESULTS AND DISCUSSION

Impact of Season on Birth Weight and Litter Size

Table 1 showed that, there is a significant difference (P<0.01) between the mean values of birth weight and litter size of newborn lambs in the two seasons of birth. As in warm season the mean value of birth weight and litter size were higher (2.94 kg, 1.61) and lower in cold season (2.04 kg, 1.16), respectively; this may be owed to good environmental conditions and availability of good quality feed stuffs in spring season. The results may agree with Queiroz *et al***.** [11], who showed a significant effect of season on birth weight and litter size.

Impact of Season on Age at 1st Kidding and Kidding Interval

Results in Table 2 revealed that there was a significant difference (P<0.01) of age at 1st kidding and kidding interval according to season, as age at 1st kidding was 13.48 months and 10.37 months for cold and warm season, respectively. Moreover, the kidding interval was 8.16 months for cold and 9.13 months for warm season, respectively. These results agreed with Marai *et al*., [15] that concluded a significant relationship between kidding season and reproductive performance ewe.

Table 1: *Effect of Season on Birth Weight (kg) and Litter Size (Number).*

Season	Parameter	
	Birth weight (kg)	Litter size
Cold season	2.04±0.08^{b}	1.16±0.05^{b}
Warm season	2.94±0.13^{a}	1.61±0.03^{a}

Means with different letters within the same column are significant at P <0.01.

Table 2: *Impact of Season on Age at 1st Kidding and Kidding Interval (Months).*

Season	Parameter	
	Age at 1st kidding	Kidding interval
Cold season	13.48±0.22^{a}	8.16±0.32^{b}
Warm season	10.37±0.31^{b}	9.13±0.24^{a}

Means with different letters within the same column are significant at P <0.01.

Enterprise Budget for Sheep Flocks

One of the best ways to estimate the profitability of small ruminant enterprise is to do an enterprise budget. An enterprise budget is a simple listing of income and expenses. According to Table 3, the most important variable inputs in small ruminant production were labor, feed and veterinary inputs. The mean value of revenue was 39456 EGP per year/flock formed of 20 heads**.** Moreover, the total cost was 42297.36 EGP per year/flock. Furthermore, the feed cost represents 42.5% of variable cost, and labour represents 47.2% of variable cost; also the benefit cost ratio was 1.57. Kenyon *et al*., [14] concluded that, return on capital in the farming business has been around 1% per annum. However, property values have increased by around 10% offsetting the low return on capital from farming sheep.

Impact of Demographic Characters on Profitability of Sheep Farms

Production function estimated in logarithmic form that is more accurate to demonstrate and determine the best accurate regression function to describe the relationship between profitability (Profit) as dependent variable and demographic characters (education level and producers' age) as independent variable.

The results revealed that function was highly significant (P<0.01) and about 31% in profit changes were attributed to the changes in demographic characters. As concluded in Table 4, the elasticity of education level was about (+1.25), that means as the education level increase by about 10% resulted in increase of total profit by 12.5%.

Table 3: *Variables Inputs of Enterprise Budget for Sheep Production (EGP).*

Variables	Mean ± SE	% from total cost	Benefit/ cost ratio
Labour/year	20000±250.34	47.2	1.57
Feed/head/year	1700.37±131.67	42.5	
Disinfectant/year	1042.13±158.53	2.46	
Vaccine/year	1534.00±909.37	3.62	
Drugs/year	1721.23±160.12	4.00	
Number of flock	20.00±3.85		
Total variable cost/year	42297.36±1730		
Total revenue/year	39456±1521.22		

Meanwhile, the elasticity of producers' age was about (+1.82), that means the increase in age of producer by 10% resulted in increase of total profit by 18.2%. These results may be owed to that education level has a positive role in adoption of the new technologies and breeding programmes in sheep farms. Also producers' age has a positive effect on profitability and productivity through gained experience and decisions taken in the policy of production [16].

Relationship between demographic characters and profit

Function	**Log Profit = 5.53 + 3.42 LogX_1 + 2.87 LogX_2**
t	(9.06) ** + (6.19) **
F	211.45**
R^{-2}	0.31

*** Significant at (P<0.01)*
X_1= Education level, X_2= Producer age.

Table 4: *Elasticity for the Demographic Characters Affecting Profitability.*

Variable	**Elasticity**
Education level	+1.25
Producers' age	+1.82
Total	+3.07

Effect of Reproductive Efficiency Indices on Profitability of Sheep

The results in Table 5 revealed that, the logarithmic production function was highly significant (P<0.01), and about 67% from the changes profitability were attributed to the changes in reproductive efficiency indices.

As illustrated in Table 5, the average elasticity of age at first kidding was about (-0.21), meaning that the increase in age at first kidding by about 10% resulted in decrease in profitability by 2.1%. Moreover, the average elasticity of service per conception was about (-0.18), meaning that the increase in number of service per conception by 10% resulted in decrease of profitability by 1.8%.

The average elasticity of days open was about (-0.35), meaning that the increase in days open by 10% resulted in decrease of profitability by 3.5%. Furthermore, the average elasticity of kidding interval was about (-0.46), meaning that the increase in kidding interval by 10% resulted in decrease of profit by 4.6%.

Function	**Log Profit = 41.543 - 0.21 LogX_1 - 0.182 LogX_2 - 0.351 LogX_3-0.462 LogX_4**
t	- (9.65) ** - (9.11) ** - (10.41) ** - (7.89) **
F	134.98**
R-2	0.67

*** Significant at (P<0.01)*
X_1= Age at 1st kidding, X_2 = Service/conception, X_3 = Days open, X_4 = Kidding interval

Table 5**:** *Different Elasticity for the Independent Variables Affecting Profitability.*

Variables	**Elasticity**
Age at first kidding	-0.21
Service per conception	-0.18
Days open	-0.35
Kidding interval	-0.46

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