

Estimating Economic Returns of Sheep and Goat Rearing in Karak Governorate

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ABSTRACT

This study aims to estimate the economic returns of sheep and goat rearing as well as total cost and returns to identify the profit margin made by out each farmer. The random sample consists of 196 breeders who breed 58240 , sheep and goats in the Karak governorate of Jordan. The sample represents 13% of the total sheep and goat population (445300) in Karak. The primary data were collected through personal interviews with farmers using a questionnaire. The questionnaire was designed to achieve the study objectives and consisted of three themes. The first theme was questioning the variables that relate to the farmer's personal characteristics (demography). The second theme contains a set of questions regarding financial production cost and return parameters during the milking season including the marketing process. The third theme consists of information about the return from selling individual sheep and goats and products such as wool and manure. The collected data from the questionnaire were statistically analyzed following Likert 5 Scale The financial analysis was conducted using Gross margin analysis. The findings of the analysis show that 52.6% of farmers were above 50 years old. the average size of the herd was 297. The variable cost for the herd was 13067.98, Jordanian Dinar, while the total returns were 17104.54, JOD, and the Gross margin ratio was 0.23599. The amount of milk production was (3,494.4) tons in a season lasting 3 months on average. The average prices of milk of goats and sheep are 1.1 and 0.87 JOD/kg, respectively, Moreover, 53.3% of the farmers processed the domestically produced milk into Jameed, butter, and margarine. The result of the analysis of gross margin was 30%, indicating the sheep and goats rearing projects make profits in Karak Governorate. The study recommends that a national program should be developed to maintain local breeds, set appropriate standards, and define trademarks for the local production of Jameed and domestic margarine.

Keywords: Karak Governorate, sheep and goats, profit margin, return, Jameed, Dairy products

INTRODUCTION

The agricultural sector is the cornerstone of the Jordanian economy despite its very limited contribution. It plays an important role in achieving food security, where food security has priority at international levels during the current days of the COVID-19 pandemic

(Teixeira, *et al*, 2020). Livestock production is one of the basic components of agricultural production, contributing to employing manpower and providing valuable products, (National Agricultural Development Strategy, 2020-2025).

Karak governorate, in the South of Jordan, is well known for rearing goats and sheep for producing lambs

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for local and international export as well as unique dairy products. The number of sheep and goats in Karak is (442,300). The famous dairy product produced by Karak farmers is Jameed; a dried yogurt. Which was widely used for making the most famous Jordanian causing; Mansaf. The number of householders rearing sheep and goats is more than 10,000 (Karak Governorate Agriculture Directorate, 2021). Sheep and goat rearing is characterized by rapid capital turnover because it relates to reproductive efficiency and rapid reproduction of the animals (Zafzafi, 2019). Sheep and goat rearing does not require high-cost labor and they produce various products such as meat, milk, wool, and manure (FAO & OIE, 2021). In general, the role of the small ruminant (sheep and goat) sector of Jordan in support of food security and poverty alleviation was identified Al-Atiyat, (2014). Other countries such as European Countries reported comprehensive sustainability of the sheep and goat rearing sector which was better in the United Kingdom than Finland and Italy. (Paraskevopoulos, *et al*, 2020)

European sheep and goat sectors are more sustainable, competitive, and resilient because of the availability of strong cooperation between industry and research institutions to find appropriate solutions for emerging problems. (Vouraki, S, *et al* 2020) On the other hand, Tantawi and Bazina (2018) stated sixteen obstacles faced by the Egyptian sheep and goat sector, the most important of which was the high prices of feed (73.2% of the production cost). Likewise, Al-Najjar, *et al*. (2014) identified the obstacles faced production and marketing of sheep meat in Hama; Syria. The obstacles were the monopoly of merchants; reduce marketing costs, and limited marketing information on prices and their expectations.

This study was an attempt to estimate the return on sheep and goat rearing in Karak governorate from dairy products and selling live animals, wool, hair, and manure. Jameed was considered the main dairy product in the Karak governorate due to its close connection with the food pattern of the population in Jordan and the fact that it was a local product produced by women and girls in the breeder's family (Hashem, 2020). It was an income-

generating product that creates job opportunities, along with other products such as the processing of cheese, ghee, and wool. Sheep and goat breeders suffer from poor marketing of their products, low prices, and increased competition by local products such as liquid Jameed or the Jammed imported from Syria and Turkey. Jameed processing must be improved in terms of shape and size, and the Jordanian standard for Jameed must be redrafted in order to distinguish its specifications in quality and nutritional value, and a brand that gives the local product a special color that matches its economic and social importance must be created.

The main objective of this study was to estimate the return on sheep and goat rearing and the sub-objectives include:

1. To identify the profit margin made by a breeder.
2. To estimate the variable cost of rearing and production processes.
3. To estimate total returns on the sale of live animal and dairy products.

Methodology:

A random sample consisting of 196 farmers who reared, 58240 sheep and goats (39816 sheep and 18424 goats), was selected. The average size of the sheep flock was 188 and the goat herd was 109goats.

The primary data were collected using a questionnaire through personal interviews with the farmers. The questionnaire consists of open and closed-ended questions to achieve the study objectives. The questionnaire consists of three themes. The first part of the questionnaire contains general information related to the farmer's personal (demography) characteristics. The second part contains a set of questions composed of 18 items. Such questions aim to estimate the returns of dairy products and the total cost of production from the beginning of the milking season to the product marketing. The third theme consists of 8 items that aim to estimate a breeder's return from the sale of live animals, wool, and manure.

Likert 5 Scale was used to analyze data, where positive items were given (always= 5, often= 4,

sometimes= 3, rarely=2 and never=1), while the scale was reverse for the negative items (never=1 point, always=5 points) with an arithmetic mean of (3). Each of the study variables was divided into three levels (high, average, and low) depending on the realization of the adopted Likert 5 Scale by the farmers, where (always) and (often) indicate the high level, (sometimes) indicate average level, while (rarely) and (never) indicate the low level. Then, the questionnaire was field-tested. In light of the results of the field test, necessary adjustments were made to design the final questionnaire. A reliability tool was used to measure the internal consistency. The value of Cranach's alpha was 0.82 which reflects the internal consistency of the study scales.

Results and Discussion:

Personal Characteristics of the Study Sample:

Table (1) shows the distribution of farmers into categories by variables of age, social status, and level of

education. The Table shows that the largest proportion of farmers falls into the age group 50 years and above by 52.6%, the young farmers represent less than 4%, and the age group 30-50 represents about 44%. This shows the reluctance of young people to work in sheep and goat rearing. The social status percentages show the importance of household work in sheep and goat rearing, especially the processing of dairy products, where the findings show that 95% of farmers are family heads. The level of education variable shows that 91% of farmers have attained high school certificates and below. This indicates that sheep and goat rearing is not desirous by the educated people and that the rearing and milk processing methods are still the traditional ones followed in the countryside and Badia.

Table1. Frequencies and Percentages of Personal Characteristics of the Study Sample.

Variable	Number	Percentage	Arithmetic mean	Standard deviation	Highest value	Lowest value
Age						
Under 30	7	3.6	51.36	9.36	80	21
30-50	86	43.9				
50 and above	103	52.6				
Total	196	100				
1. Social status	Number	Percentage				
Single	9	4.6				
Married	187	95.4				
Total	196	100				
2. Level of education	Number	Percentage				
Illiterate	21	10.7				
Basic education	77	39.3				
High school	80	40.89				
Diploma	13	6.6				
University	5	2.6				
Total	196	100				

Source: data of study sample.

Return from dairy products:

Table (2) shows the findings of a milking variable. Given that the process of milking sheep and goats is manually made in pastures or places where the herd gathers for the night and in the early morning or late

evening times, this process needs special organization and arrangement by the breeders. More importantly, the milk must be disposed of very quickly and immediately after the process of Milking as it is perishable, especially on summer days. Based on the variables of the milking process, including the start of the season of milking the

herd on a monthly basis, the daily milking time, once in the morning or evening, or twice in the morning and evening, and the number of animals required to be milked as well as those who perform the milking process, the findings show that February and March of each year are the months of the beginning of the milking season. The results showed that 50.3% of the farmers perform the milking process in the evening and that 42% perform the milking process in the morning and evening, while 7.6% of farmers perform the milking process once in the morning. The said percentages indicate that the time of milking is closely related to pasture and how close it is to the population centers to ensure that the milk produced

reaches homes or processing places directly and timely. The number of animals that are milked manually is an average of 158 sheep and 94 goats, i.e. 252 sheep and goats which is the average size of the herd. As for the milking workers, the study shows that the percentages are 51.8% of farmers perform the milking process through family members, 26.1% of the milking processes are carried out by herdsman, and 22% of the milking processes are carried out by hired labor. This shows the importance of household work in sheep and goat rearing and for benefiting from dairy products

Table 2. Results of analysis of milking the herd.

Variable	Number	Percentage
Date on which milking starts		
• February	84	43.5
• March	102	51.5
• April	6	3.0
• May	4	2.0
Total	196	100
1. Daily milking time		
• In the morning	15	7.6
• In the evening	99	50.3
• In the morning and evening	82	42.1
Total	196	100
2. Number of animals that are manually milked in average		
Sheep	158	-
Goats	94	-
3. Those who perform milking process		
Family	102	51.8
Herdsman	51	26.2

Paid workers	43	22.0
Total	196	100

Source: data of study sample.

Milking process and costs:

Results of analysis of the study data show that the total number of sheep and goats of the farmers is 58240 (39816 sheep and 18424 goats), and the average size of herds is 252 (158 sheep and 94 goats).

The monthly herd milking cost is JOD 6698.29 (26.58 per head), which represents 7% of the price of a Kilogram

(kg) of milk, on the assumption that the average daily milk production per head is one kg. The results of analysis of the study data show the quantity of milk production by the farmers is (3,494.4) tons in the season, which lasts for 2-3 months for about 79.2% of farmers and for less than 2 months for 10.2% of the farmers and for more than 4 months for 10.6% of the farmers

Table 3. The variable of Milking Season of Farmers

How long milking season last	Number	Percentage	Arithmetic mean	Standard deviation
Less than 2 months	20	10.2	3.02	0.51
2-3 months	155	79.2		
More than 4 months	21	10.6		
Total	196	100		

Source: data of study sample

Analysis of sale of products:

The quantity of milk produced is a remunerative herd return, though it is difficult to obtain and though the family members or shepherds make every effort to perform the milking process, which should be followed quickly and directly either by the sale of such product or processing it into dairy products.

Many breeders prefer to sell milk immediately after milking in order to save the effort of family labor the get remunerative prices in most cases. Results of the analysis show that 46.7% of farmers prefer to sell milk directly after the milking process, while 53.3% prefer to process the milk in the household. This indicates the importance of the household processing of dairy products to produce Jameed as well as butter and ghee. The results show that those who do not sell their milk are divided into three

groups. The first group processes Jameed in the household and sells the surplus products. The second group produces a small amount of milk that is unmarketable, the milk processed in households, and the surplus amounts sold in the local market or to neighbors. The third group's products meet their food needs, where most goat and sheep breeders depend on milk and dairy products in the production seasons. The sale of dairy products is very important for a breeder. Table (3) shows that the breeders who sell milk either sell it in the village to families that are specialized in the processing of milk products or sell it in markets of the governorate that are able to deliver the milk shortly to the production places immediately after milking or to cooperatives that are specialized in processing milk and are able to maintain quality of milk by rapid cooling or pasteurization.

Table 4. Analysis of Marketing of Milk and Dairy Products Variable.

Variable	Number	Percentage
Do you sell the produced milk?		
Yes	91	46.7
No	105	53.3
Total	196	100
If you answer is (No), please explain why	Number	Percentage
A marketable amount is not produced	27	25.7
No good price	13	12.4
Produced and consumed by the family	30	28.6
There is no demand in the local market	35	33.3
Total	105	100
If the answer is (yes), where do you sell the product		
Inside the village	61	67.4
markets outside the village	24	26.1
Cooperatives	6	6.5
Total	91	100

Source: data of study sample.

Analysis of Marketing of Dairy Products Variable:

Dairy products, including Jameed, are of great economic importance to sheep and goat farmers. The families process this product in the traditional way, taking into account the conditions of complete hygiene, and produce Jameed, which is distinguished by its bright white color and traditional spherical shape. The correct drying process of the product gives advantages to this product in terms of taste and easy melting for cooking. Hence, marketing the product to colleagues and friends based on experiences is one of the most effective ways in marketing. The selling price of the product, which ranges between 18-37 dinars, depends on its specifications and on the reputation of the family that processes it in the local market. The process of milking the herds is the essence of the production process in terms of cost and quality, as the

milking in a good way that takes into account the principles of general hygiene and takes place in a timely manner and does not allow the quantity produced to be exposed to pollution or high temperatures, and the delivery of milk to the place of production in a clean and safe manner and in a short time are reasons for the quality of production and excellence in terms of taste and flavor. The biggest problem faced by milking sheep and goats is the time required to complete the process of milking the herd manually. Optimally, male or female milking workers cooperate with each other to milk the herd so that the process is completed as quickly as possible. Usually, the goat and sheep breeders who sell the products make great efforts to complete the milking process in the fastest time, where the milk is transported quickly to the manufacturing places, whether they are small factories, cooperatives, or homes specialized in milk processing.

Table (5) shows that 66.4% of the farmers deliver the sold milk to the buyer, while 33.6 of them receive the buyer on the farm to deliver the milk to him.

However, the delivery time of milk in a way that ensures its suitability for processing is one of the most important production challenges. In addition, delivering the product to the buyer increases production costs and contributes to raising the prices of the product. The costs of transporting milk from the place of production to the buyer or factory amounted to about 3.18 JOD/day, with a monthly average of 123 JOD. The findings of the study show that the average selling price of a kilogram of milk is (1.1) JOD for sheep milk, while a kilogram of goat milk is sold for (0.87) JOD. Usually, the price increases or decreases according to transportation distance.

Processing and marketing of dairy products:

Milk products include Jameed, cheese, butter, and ghee, all of which are homemade, but the bulk of the processed milk is used to process Jameed and butter that is converted into ghee. The results of the study sample show that about 78.6% of the farmers process milk through family members or hired workers and that 21.4% of the farmers sell their milk products in the local market, whether for cheese or Jameed production. According to the results of the sample, the quantities processed and sold by the farmers, on average, amounted to 127.5 kg of Jameed, 144.16 kg of domestic cheese, 57.5 kg of ghee, and 11.34 kg of butter. The selling prices of such products according to the farmers' responses were 13.59 JOD/ kg for Jameed and 8.6 JOD / kg for cheese and about 10.79 JOD / kg for ghee and 7.37 JOD for butter.

Table (5) Results of Processing and Marketing of Dairy Products Variable.

Variable	Number	Percentage		
Do you process milk at home?				
Yes	154	78.6		
No	42	21.4		
Total	196	100		
What are the processed quantities sold according to the season?	Arithmetic mean	Standard deviation	Highest value	Lowest value
Jameed/kg	127.50	201.86	2000	15
Cheese/kg	144.16	274.37	700	10
Ghee/kg	57.50	82.11	600	5
Butter/kg	11.34	11.77	35	6
What are the selling prices for the products processed for this season?	Arithmetic mean	Standard deviation	Highest value	Lowest value
Jameed/JOD/kg	13.59	11.05	80	8
Cheese/JOD/kg	8.60	4.97	15	5
Ghee /JOD/kg	10.79	6.82	60	0.80

Butter/JOD/kg	7.37	0.75	8	6.50
1- Where do you sell the products?	Number	Percentage		
Neighbors and friends	150	76.5		
Traders inside the governorate	42	21.4		
Traders outside the governorate	4	2.0		
Total	196	100		

Source: data of study sample.

The products are usually marketed on a seasonal basis through family relations within the Karak governorate. The results show that 76.5% of the products are marketed through friends and neighbors, while 21.4 are marketed by traders from within the governorate, and a very small percentage of up to 2% are sold to traders from outside the governorate. This shows the need for modern marketing methods that preserve the local product's reputation and provide customized products.

Return from the sale of live animals, wool, hair, and manure:

According to the data of the study findings, the number of the farmers' population was 252 sheep flocks and goat herds (62.7% sheep and 37.3% goats), and the numbers of sheep and goat newborns in the season were 125 sheep and 84 goats. According to farmers, 84 sheep were sold for 79.3 JOD/sheep and 42 goats were sold for 72.5 JOD/goat. 21 goats and 14 sheep sold at the end of the seasons were excluded from the herd, where the sheep were sold for 210 JOD and the goat were sold for 140 JOD, as shown in Table (6). The numbers prove the validity of the questionnaire data, where farmers' responses greatly match the reality in terms of the number of births and selling prices.

Table 6: Results of Sale of Live Animals Variable.

Variable	Arithmetic mean	Standard deviation	Higher value	Lowest value
How many births are there in this season?				
Sheep	125	208	2300	3
Goats	64	20	260	2
How many newborns were sold in this season?				
Sheep	84	147.07	1600	5
Goats	42	37.59	200	3
How many old animals were sold?				
Sheep	21	18	100	3
Goats	14	13	65	4

The selling prices of newborns				
Sheep/JOD	79.3	4.2	120	72
Goat/JOD	72.5	5.4	90	68
Selling price of old animals				
Sheep/JOD	210	18	100	3
Goat/JOD	140	13	65	4

Source: data of study sample.

Results of analysis of the study data show that the farmers' production of wool is 169.44 kg, and hair is 5.25 kg, respectively, as shown in Table (7). At large, the total expenses on the herd in a single season for all farmers

were 13067.54 JOD on average, while the total returns were 17104.54 JOD, with a profit margin of 4,036.56 JOD.

Table 7: Results of Analysis of Sale of Other Products of the Herd

Variable	Arithmetic mean	Standard deviation	Higher value	Lowest value
What is your production of the following this season:				
Wool/kg	169.44	132.06	400	35
Hair/kg	5.25	6.71	10	0.50
Domestic manure/Truck	75	26.45	100	45
Total return/JOD/season	17104.54			
Total variable expenditures/JOD/season	13067.98			
Profit margin/JOD	4,036.56			

Source: data of study sample

Gross Margin analysis:

Gross margin is one of the profitability ratios usually used to measure the extent to which the project or agricultural activity has achieved profit, define gross margin in simpler terms, it is simply gross profit, stated as a percentage of the revenue.

Gross margin is given as:

Gross Margin = Total Revenue -Total variable cost.
(Choumbou. R, *et al*, 2015).

GM = TR – TVC = 17104.54 -13067.98 = 4036.56.

The formula for gross margin percentage is as follows:
Gross margin = 100 * profit/revenue (when expressed as

a percentage). The profit equation is profit = revenue - costs, so an alternative Gross margin formula is: Gross margin = 100 * (revenue - costs) / revenue.

Gross margin = (17104.54–13067.98) ÷ 17104.54 = 0.23599.

The results of the analysis show that sheep and goat rearing in Karak governorate is achieve a gross margin ratio of 23.6%, which is a good ratio that indicates profitability.

Conclusions:

The findings of this study show that sheep and goat rearing in the Karak governorate is one of the most

important pillars of economic life in the governorate. The method of rearing, the method of production, and the management of the herd are part of the societal culture that still persisted for decades. A flock or herd rearing mainly depends on grazing during the day and on all days of the year, regardless of the quality of the pasture or the amount of feed that is available.

The herds are provided daily with feed, which is obtained from special centers supervised by the state at subsidiary protocol and prices. Processing of dairy products is still performed through primitive methods carried out mainly by household labor. Meanwhile, the marketing of the products suffers from poor marketing opportunities and price fluctuations. Finally, the study

recommends a national program to preserve the local breeds of sheep and goats and improve their productivity through genetic improvement, animal health care, and applying modern techniques of machine milking. Summing up, marketing opportunities are needed to develop brands, especially Jameed and domestic ghee. Furthermore, the local production should be protected, fraud should be combated, and conditions for the determination of specifications of the imported quantities of Jameed should be developed to evidently distinguish them from the local production.

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تقدير العائد الاقتصادي على المزارعين من تربية الأغنام والماعز في محافظة الكرك

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ملخص

استهدفت هذه الدراسة تقدير العائد الاقتصادي من تربية الأغنام والماعز، وتقدير التكاليف الكلية والعائدات، للتعرف على الهامش الربحي الذي يحققه المزارع، أخذت عينة عشوائية بسيطة حجمها 196 مزارع بمجموع (58240) رأس لمزارعي العينة، شكلت ما نسبته 13% من مجتمع الدراسة البالغ (445300) رأس جمعت البيانات الأولية بواسطة المقابلة الشخصية مع المبحوثين باستخدام استبانة لتحقيق أهداف الدراسة، واشتملت على ثلاثة محاور: الأول محور المتغيرات التي تتصل بالخصائص الشخصية للمبحوثين، والثاني تضمن مجموعة من الأسئلة مكونة من 18 فقرة؛ هدفت لتقدير العائد من منتجات الالبان، وتقدير التكاليف الكلية للإنتاج من بداية موسم الحلابة حتى تسويق المنتجات، أما المحور الثالث، فتكون من 8 فقرات هدفت لتقدير العائد على المزارع من بيع الحيوانات الحية والصوف والسماذ. تم تحليل بيانات الاستبيان احصائيا واستخدم مقياس ليكرت الخماسي، وتم التحليل المالي باستخدام بعض مؤشرات الربحية في ميزانية النشاط مثل هامش الربح الاجمالي، وأظهر تحليل النتائج أن 52.6% هم من الفئة العمرية 50 سنة فأكثر. كما أظهرت نتائج التحليل أن متوسط حجم القطيع (297) رأس، وقد بلغت التكاليف المتغيرة (13067.98) دينار لقطعان العينة، في حين كان اجمالي العائدات (17104.54) دينار، وهامش ربح نسبته (235990)، ووضحت النتائج ان متوسط سعر بيع كغم الحليب هو (1.1)، دينار لحليب الضأن و (0.87) دينار لحليب الماعز، كما بينت ان كمية انتاج الحليب تقدر (3,494.4) طن في الموسم، وان 53.3% من المبحوثين يقومون بتصنيع الحليب منزليا لإنتاج الجبنة والزبد والسمن، وكانت نتيجة تحليل هامش الربح الاجمالي 30%، مما يعطي مؤشرا على ربحية مشاريع تربية الاغنام والماعز في محافظة الكرك. اوصت الدراسة بوضع برنامج وطني للمحافظة على السلالات المحلية، ووضع مواصفات قياسية ملائمة، وتحديد علامات تجارية للإنتاج المحلي من الجبنة والسمن البلدي.

الكلمات الدالة: محافظة الكرك، الاغنام والماعز، هامش الربح، تقدير العائد، الجبنة، منتجات الالبان