

# The economics of sheep and goat meat production in Egypt "a case study in Gharbia Governorate"

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## Abstract:

The sheep and goat production sector is one of the constituent sectors of animal production in Egypt, as it is an important source of meat. The research problem is the decrease in the contribution of sheep and goat meat to the total production of red meat. This led to a rise in the price level of meat, milk and wool of sheep and goats. The research mainly aims to study the economic efficiency of producing lamb (sheep) and goat meat at the level of the research sample in Gharbia Governorate. The research relied on both descriptive and quantitative analysis methods. The research indicated that the quantity produced of sheep and goat meat increased by about 0.051 and 0.096 thousand tons annually in Gharbia Governorate, respectively, during the period (2015-2019). The difference in the average variable costs of the head of the fattened goats in the fattening cycle in the two groups of the study amounted to about 199.1 pounds while the difference in the average total costs of the head amounted to 201.1 pounds, respectively.

**Keywords:** nutritional gap, consumer price, productive efficiency, price efficiency, economic efficiency.

Date of Submission: 25-02-2022

Date of Acceptance: 06-03-2022

## I. Introduction

The sheep and goat production sector is one of the constituent sectors of animal production in Egypt, as an important source of red meat. The average amount of meat produced from sheep and goats in Egypt during the period (2015-2019) is estimated at about 49 30 thousand tons, representing about 6.9% 4.14%, respectively, of the average production of red meat in Egypt, estimated at 712 thousand tons, and the sheep and goats sector in Egypt is one of the sources of dairy production, and the amount of milk produced from goats is estimated at about 96.5 thousand tons in the same period, representing about 1.9% of the average production in Egypt of the milk, estimated at 5204 thousand tons(4), and this sector provides hair, wool and leather that are used in the manufacture of clothing and clothing of high market value, and goat farming has a strong impact on the development of human societies, especially rural ones, because their meat and milk represent additional sources of income It can also be bred in hot and dry desert areas to withstand heat stress.

Al Gharbia Governorate is one of the governorates where sheep and goat breeding is widespread. The average number of sheep and goats in Gharbia Governorate is estimated at 153.2 and 85.8 thousand heads, representing about 3.30% and 2.55% of their average numbers at the level of Egypt, which amount to about 4647.2 and 3365.6 thousand heads each, respectively, during the period (2015-2019)<sup>(2)</sup>.

## II. Problem

The research problem is the rise in the prices of sheep and goat meat in the Egyptian market compared to the prices of other meat in a way that is not commensurate with the limited income levels of the Egyptian consumer, which led to a decrease in the average per capita share of sheep and goat meat to about 0.8 0.4 kg (4), respectively, during the same period, and what exacerbates the problem is the decrease in the contribution of sheep and goat meat to the total production of red meat to about 79 thousand tons, representing about 11% of the average production of red meat, which amounts to about 712 thousand tons during the period from (2015-2019)(4), with a reluctance to Many breeders are interested in raising sheep and goats, which requires attention to studying this problem to learn about the economic efficiency of sheep and goat meat production and how to find solutions to increase the volume of production to achieve a surplus in the size of the food gap of those meat in Egypt.

## III. Research aims

The research mainly aims to study the economic efficiency of producing lamb (sheep) and goat meat at the level of the research sample in Gharbia Governorate, through a set of sub-objectives:

- Study of the current situation of the size of the nutritional gap of lamb and goats in Egypt.
- Studying the price relationship to consumer prices for mutton and other meat in Egypt.
- Studying the economic efficiency of lamb and goat meat production in the research sample.

#### **IV. Research method and data sources**

The research relied on both descriptive and quantitative analysis methods through the use of a set of tools, measures and statistical methods such as percentages, arithmetic averages, some indicators of economic efficiency, regression relationships and statistical hypothesis tests, which help achieve the research objectives.

The research also relied on two sources of data, the first is the published and unpublished secondary data, and the second is the primary data through a field questionnaire for the research sample in Gharbia Governorate.

#### **V. Results and discussion**

##### **(First): Evolution of the size of the nutritional gap for sheep and goat meat in Egypt during the period (2000-2020):**

This part of the research deals with the study of the volume of production and available for consumption of sheep and goat meat to estimate the size of the food gap in the national level during the research period as follows:

##### **A - The evolution of the size of the nutritional gap for sheep meat in Egypt during the period (2000-2020).**

###### **1- The development of sheep meat production in Egypt during the period (2000-2020).**

Table no (1) data indicates the fluctuation of the national production of sheep meat in Egypt during the research period (2000-2020), between a minimum amounted to about 32 thousand tons in 2018 and a maximum amounted to about 86 thousand tons from 2006 to 2008, and an annual average estimated during the research period about 68 thousand tons, and estimating the equation of the general time trend in Egypt during the research period in equation No. (1) in Table no (2) it was found that it took a general decreasing and statistically significant trend at the level of significant 0.01 with a decrease estimated at about 1.908 thousand tons annually, representing about 2.81% of the average national production of sheep meat in Egypt during the same period, and the adjusted coefficient of determination was about 0.537, which means that about 53.7% of the annual changes in the national production of sheep meat in Egypt are attributed to those factors whose impact reflects the time factor.

###### **2- Available for consumption of sheep meat during the period (2000-2020):**

Table no (1) shows the fluctuation of the national consumption of sheep meat in Egypt during the research period, between a minimum amounted to about 34 thousand tons in 2018 and a maximum amounted to about 90 thousand tons in 2008, and an annual average estimated during the research period of about 70 thousand tons, and an estimate of the general time trend equation in Egypt during the research period, according to equation No. (2) in Table no (2), it was found that it took a general decreasing and statistically significant trend at the level of significant 0.01 with a decrease estimated at 1.718 tons annually, representing about 2.46% of the average net national consumption of sheep meat in Egypt during the research period, and the adjusted coefficient of determination was about 0.422, which means that about 42% of the annual changes in the net national consumption of sheep meat in Egypt are attributed to those factors whose impact reflects the time factor.

###### **3- Individual consumption of sheep meat during the period (2000-2020):**

Table no (1) shows the fluctuation of individual consumption of sheep meat in Egypt during the research period, between a minimum amounted to about 0.3 kg / year in 2018 and a maximum amounted to about 0.9 kg / year during the years from 2000 to 2004, with an annual average estimated during the research period of about 0.7 kg/year, and by estimating the equation of the general time trend in Egypt during the research period in equation No. (3) in Table no (2), it was found that it took a general decreasing and statistically significant trend at the level of significant 0.01 with a decrease estimated at 0.026 kg/year, representing about 3.87% of the average individual consumption of sheep meat in Egypt during the research period, and the adjusted coefficient of determination was about 0.781, which means that about 78.1% of the annual changes in the individual consumption of sheep meat in Egypt are attributed to those factors whose impact reflects the time factor.

###### **4- The gap of sheep meat during the period (2000-2020):**

The data in Table no (1) indicate the fluctuation in the size of the gap of sheep meat in Egypt during the research period, as it ranged between a minimum amounted to about zero thousand tons in 2003 and a maximum amounted to about 11 thousand tons in 2020, and there is a surplus of about 12 thousand tons in the year 2012, with an annual average (surplus or deficit) estimated during the research period at about 1.9 thousand tons, and by estimating the equation of the general time trend in Egypt during the research period in equation No. (4) in Table no (2) it was found that it took a general and statistically significant increasing trend at the level of significant 0.01 with an increase estimated at 0.221 thousand tons annually, representing about 8.60% of the

average gap of sheep meat in Egypt during the same period, which is about 2.57 thousand tons, and the adjusted coefficient of determination was about 0.253, which means that about 25.3% of the annual changes in the gap of sheep meat in Egypt are attributed to those factors whose effect reflects the factor of time.

## B- The evolution of the size of the food gap for goat meat in Egypt during the period (2000-2020):

### 1- Evolution of the quantities of goat meat produced and available for consumption for goat meat in Egypt during the period (2000-2020):

Table no 1 shows the fluctuation in the quantities of goat meat produced and consumed in Egypt during the research period (2000-2020), between a minimum amounted to about 19 thousand tons in 2018, and a maximum amounted to about 62 thousand tons in 2008, and an annual average estimated during the research period of about 46 thousand tons, and by estimating the equation of the general time trend of the quantities of goat meat produced and consumed in Egypt during the research period by equation No. (5) in Table no (2), it was found that it took a general decreasing and statistically significant trend at a level of significance 0.01 with a decrease estimated at about 1.356 thousand tons annually, representing about 2.95% of the average net national production or consumption of goat meat in Egypt during the research period, and the adjusted coefficient of determination was about 0.526, which means that about 52.6% of the annual changes in the production and consumption of goat meat in Egypt are attributed to those factors that reflect their impact time factor.

### 2- Individual consumption of goat meat during the period (2000-2020):

Table no (1) also indicates the fluctuation of individual consumption of goat meat in Egypt during the research period, as it ranged between a minimum amounted to about 0.10 kg / year in 2018 and a maximum amounted to about 0.60 kg / year during the years from 2000 to 2004, with an annual average during the research period amounted to about 0.40 kg / year, and by estimating the equation of the general time trend of individual consumption in Egypt during the research period (2000-2020), according to equation No. (7) in Table no (2) it was found that it took a general decreasing and statistically significant trend at a level of significance 0.01 with an decrease estimated at 0.021 kg/year, representing about 4.95% of the average individual consumption of goat meat in Egypt during the research period, and the adjusted coefficient of determination reached about 0.766, which means that about 76.6% of the annual changes in the individual consumption of goat meat in Egypt Attributed to those factors whose effect reflects the time factor. For goat meat, no nutritional gap was found, as the national production of goat meat is equivalent to the national consumption.

**Table no 1:** The size of the nutritional gap of sheep and goat meat in Egypt during the period (2000 - 2020):

year	Sheep				Goat		
	national production (thousand tons)	available for consumption (thousand tons)	Individual consumption (kg/year)	Gap size (thousand tons)	national production (thousand tons)	available for consumption (thousand tons)	Individual consumption (kg/year)
2000	73	75	0.9	(2)	51	51	0.6
2001	75	77	0.9	(2)	52	52	0.6
2002	83	84	0.9	(1)	54	54	0.6
2003	83	83	0.9	0	57	57	0.6
2004	80	81	0.9	(1)	57	57	0.6
2005	83	84	0.8	(1)	55	55	0.5
2006	86	88	0.8	(2)	55	55	0.5
2007	86	88	0.8	(2)	61	61	0.6
2008	86	90	0.8	(4)	62	62	0.5
2009	85	86	0.7	(1)	59	59	0.5
2010	53	58	0.6	(5)	35	35	0.3
2011	52	53	0.5	(1)	35	35	0.3
2012	53	41	0.4	12	36	36	0.3
2013	59	61	0.6	(2)	41	41	0.4
2014	67	69	0.6	(2)	42	42	0.4
2015	61	65	0.6	(4)	39	39	0.3
2016	65	67	0.6	(2)	40	40	0.3
2017	63	65	0.5	(2)	40	40	0.3
2018	32	34	0.3	(2)	19	19	0.1
2019	50	57	0.5	(7)	37	37	0.3
2020	49	60	0.5	(11)	37	37	0.3
Average	68	70	0.7	2	46	46	0.4

Where: ( ) the numbers in parentheses express negative values.

Source: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Food Balance Bulletin, various issues.

### (Second): The price relationship to consumer prices for mutton and other meat in Egypt during the period (2000-2020):

Red meat is considered one of the good alternatives to mutton. Therefore, any change in its prices will affect the prices of mutton and the quantity consumed.

**A- The price relationship of consumer prices for mutton and kandoos meat in Egypt during the period (2000-2020):**

The data in Table no (4) shows the relationship between consumer prices for mutton as a dependent variable and the consumer price for kandoos meat as an independent variable on the linear model, and it was found that there was a positive correlation between them, as the partial correlation coefficient between the consumer price of mutton and kandoos meat was about 1, while the coefficient of

The simple regression is about 1.01, and this means that an increase in the prices of the consumer of kandoos meat by one pound will lead to an increase in the price of the consumer of mutton meat by about 1.01 pounds, and the significance of this relationship has been statistically proven at a significant level of 0.01.

**Table no (2):** Equations of the general time trend of the food gap of sheep and goat meat in Egypt during the period (2000-2020):

number	Dependent variable	function	R <sup>2</sup>	average	F	rate the change %
1	sheep meat production	$Y_t = 88.795 - 1.908 X_t$ (18.225)** (-4.917)**	0.537	67.81	24.2**	- 2.811
2	Available for consumption for sheep meat	$Y_t = 88.710 - 1.718 X_t$ (16.248)** (3.915)**	0.422	69.81	15.614**	- 2.46
3	Individual consumption of sheep meat	$Y_t = 0.963 - 0.026 X_t$ (24.580)** (-8.492)**	0.781	0.671	72.118**	- 3.87
4	Gap size in sheep meat	$Y_t = 0.143 + 0.221 X_t$ (0.144) (2.790)**	0.253	-2.57	7.784*	8.60
5	Goat meat production available for consumption Individual	$Y_t = 60.819 - 1.356 X_t$ (17.214)** (4.819)**	0.526	45.91	23.2**	- 2.95
6	consumption of goat meat	$Y_t = 0.655 - 0.021 X_t$ (20.238)** (-8.160)**	0.766	0.424	66.579**	- 4.95

Source: data analysis of Table no (1).

**B - The price relationship of consumer prices for mutton and veal meat in Egypt during the period (2000-2020):**

The data in Table no (4) shows the relationship between consumer prices for mutton as a dependent variable and the consumer price for veal as an independent variable on the linear model, and it was found that there was a positive correlation between them, where the partial correlation coefficient between the consumer price of lamb and veal was about 0.996, while the simple regression coefficient reached About 1.05, and this means that an increase in the prices of veal meat consumers by one pound will lead to an increase in the price of lamb meat consumers by about 1.05 pounds, and the significance of this relationship has been statistically proven at a significant level of 0.01.

**(Third): The regressive relations of consumer prices for mutton and individual consumption of it in Egypt during the period (2000-2020).**

The data of Table no (5) shows the relationship between the individual consumption of mutton as a dependent variable and the price of mutton as an independent variable on the linear and logarithmic models, and an increase in the price of mutton by 1% leads to a decrease in per capita consumption by about 0.29% of per capita consumption annually during the same period, and this relationship has been proven statistically significant at a significant level of 0.01.

**(Fourth): Selection of the research sample:**

Gharbia Governorate is considered one of the governorates interested in the production of lamb and goat meat in Egypt, so it was chosen to represent the breeders of these animals as a community for the research sample, through comprehensive inventory lists of sheep and goat breeders in the centers of Gharbia Governorate during the 2020/2021 season.

It is clear from Table no (6) that the sample centers were selected based on the relative importance of the number of holders and the number of sheep and goats in the centers of Gharbia Governorate, where the geometric mean was calculated for the proportion of each of the number of holders and the number of sheep in the different governorate centers, in order to choose the two highest centers in the mean value, and two centers (Qutour, Tanta) were selected for sheep, and two centers (Samanoud, Tanta) for goats to conduct the steps of the research sample with them as representatives of the centers of the Gharbia Governorate, where the two centers of Kutour and Tanta represented about 20.2%, 17.7%, and the centers of Samanoud and Tanta represented about 20.45 % and 17.39%, respectively, of the total geometric mean of the percentage of sheep and goats and the number of owners in Gharbia Governorate.

**Table no (3):** Consumer prices of mutton and other meat in Egypt (2000 - 2020):

year	consumer price of mutton (pounds/kg)	the consumer price of kandoos meat (pounds/kg)	consumer price of veal (pounds/kg)
2000	17.52	17.03	16.42
2001	17.72	17.12	14.44
2002	18.53	18.03	17.26
2003	16.68	17.04	19.92
2004	27.79	24.51	24.07
2005	29.70	26.86	25.36
2006	31.41	29.37	28.23
2007	32.38	32.86	31.72
2008	37.59	36.26	33.47
2009	40.89	40.48	37.88
2010	47.13	47.70	44.45
2011	55.53	35.02	56.74
2012	62.69	62.90	60.88
2013	70.77	67.15	65.30
2014	80.27	77.94	81.05
2015	89.57	86.69	90.39
2016	101.12	97.67	100.11
2017	142.04	139.33	136.08
2018	150.85	148.32	142.92
2019	159.66	157.31	149.04
2020	168.47	166.30	155.16
Average	66.59	64.95	63.38

**Source:** Central Agency for Public Mobilization and Statistics, **annual bulletin of prices of foodstuffs, products and services**, various issues.

**Table no (4)** Regression coefficient and simple correlation between consumer price of mutton, kandoos and veal:

model	independent variables	dependent variable	B	T	R2	F	Sig
Linear	The price of the kandoos	Mutton price	1.01	46.1	0.999	2125	**
Linear	veal price	Mutton price	1.05	72.1	0.996	5198	**

**Source:** data analysis of Table no (3).

**Table no (5):** Simple regression coefficients between consumer price of mutton and individual consumption of mutton:

model	dependent variable	independent variables	B	T	R2	F	Sig
Linear	individual consumption	Mutton price	- 0.004	- 3.89	0.44	15.1	**
logarithmic	individual consumption	Mutton price	- 0.29	- 5.8	0.64	33.5	**

**Source:** Analysis of tabular data No. (1), (3).

The two largest villages in each center were also chosen in terms of the relative importance of the breeders and the number of animals. The villages of Ibshaway and Sajeen El-Kom were from the Qutour Center, which includes 33 villages, and the total number of sheep in the two villages was about 17% of the total number of sheep in the center, and the villages of Shaqraf and Nawaj from the Tanta Center, which includes 53 villages for sheep, and the total number of sheep in the two villages was about 14.7% of the total number of sheep in the center. As for goats, the villages of Raheeb and Azizia were from the center of Samanoud, which includes 19 villages, and the total number of goats in the two villages was about 24.55% of the total number of sheep in the center, and the villages of Sberbay and Nawaj from the center Tanta, which includes 53 villages, and the total number of goats in the two villages was about 12.11% of the total number of sheep in the center, Table no (6).

**Determining the sample size:** The research sample was withdrawn by stratified random sampling from the villages of the aforementioned centers to be representative of the producers of mutton (sheep) and goat meat in Gharbia Governorate. Therefore, the number of breeders and the total number of sheep and goats in the governorate was taken into consideration when distributing the sample vocabulary of about 120 breeders of sheep, 86 breeders of goats, and the sample size was calculated using the following law<sup>(1), (4)</sup>:

$$n = \frac{z^2 \sigma^2 N}{\Delta^2 N + z^2 \sigma^2}$$

**Where:**

**N:** indicates the number of individuals in the sample.

**Z:** refers to the z-value at a significant level of 0.05 = 1.96.

**$\sigma^2$ :** indicates the variance of the population = 0.0001.

**N:** refers to the community (the number of farmers who own sheep and goats in Gharbia Governorate).

**$\Delta^2$ :** indicates the square of the permissible error =  $(0.0017885)^2$ ,  $(0.0021)^2$  (for sheep and goats, respectively).

It is clear from Table no (7) calculating the sampling fraction for the categories of the research sample, as the sampling fraction = the number of breeders (observations) selected in the category divided by the total number of breeders in the category, since the number of breeders selected for the category = (the modified geometric mean of the category x total sample year ÷ 100), the first category was (1 < 5 heads) represented by about 80 views of sheep (66 views of Qutour Center, 24 views of Tanta Center) and about 54 views of goats (39 views of Samannoud Center, 15 viewings of Tanta Center), and the second category (5 heads or more) represented by about 40 views of sheep (25 views of Qutour Center, 15 views of Tanta Center) and about 32 views of goats (19 views of Samannoud Center, 13 views of Tanta Center).

**Table no (6):** The relative importance of the number of sheep and goats and their holders in the selected villages and centers in the research sample in 2020.

Type	Center	Villages	Number of animals	Relative importance %	Number of owners	Relative importance %	Geometric mean	Adjusted geometric mean
Sheep	Qutour	Ibshway	2920	6.3	1130	22.5	11.9	52.7
		Sajeen El-Kom	4987	10.7	387	7.5	8.9	47.3
		Total Qutour Center	46630	17	5025	30	22.6	100
	Tanta	Shagraf	2141	6.8	379	6.7	6.7	49.6
		Nawaj	2479	7.9	332	5.9	6.8	50.4
		Total center of Tanta	31297	14.7	5640	12.6	13.5	100
Goats	Samannoud	Raheeben	3544	15.72	847	25.03	19.84	69.32
		Azizia	1992	8.83	302	8.92	8.78	30.68
		Total	22543	24.55	3384	33.96	28.62	100
	Tanta	Sherbay	1170	6.06	289	10.12	7.83	52.31
		Nawaj	1041	6.05	214	7.49	6.93	47.31
		Total	19311	12.11	2856	27.61	14.86	100

**Where:** the adjusted geometric mean = (Geometric mean / Total geometric mean) x 100.

**Source:** Directorate of Agriculture in Gharbia, **Animal Production Department records**, unpublished data.

It was also shown from the distribution of the research sample in Table no (8) that the first category of sheep was distributed to the selected villages according to the sampling fraction. The village of Ibshaway, Prisoner of Kom, Shagraf, Nawaj represented about 47, 9, 12, 12 views, respectively, with a total of 80 views. And for the goats, the villages of the monks, Azizia, Saberbay and Nawaj were represented by 32, 7, 9 and 6 views, respectively, with a total of 54 views, while in the second category, those villages were represented by 8, 17, 9, and 6 views, respectively, with a total of 40 views for sheep, in When the goat villages were represented by 6, 13, 8 and 5 views, respectively, with a total of 32 views.

**(Fifth): The most important indicators of economic efficiency of sheep and goat meat production in Gharbia Governorate for the 2020/2021 season.**

**A- Indicators of productive efficiency for fattening sheep and goats in the tenure categories of the research sample:**

Table no (9) shows that the number of fattened sheep and goats in the first category amounted to about 186 ÷ 100 heads, respectively, and the average period of fattening for each head of sheep and goats was about 137 ÷ 100 days, respectively, and the average increase in head weight of sheep and goats during the period Fattening is about 49.47 and 35.67 kilograms, respectively, and the daily growth rate during the fattening period is about 0.36 kilograms for each of the sheep and goats, while the number of fattened sheep and goats in the second category is about 236 and 166 heads, respectively, and the average fattening period for each head of sheep and goats was about 130 and 93 days, respectively, and the average increase in the weight of the head of sheep and goats during the fattening period was about 48.75 and 37.35 kg, respectively, and the amount of daily growth during the fattening period was about 0.38 and 0.40 kg, respectively.



**Table no (7) :** Distribution of the selected research sample of owners of sheep and goats to the different tenure categories.

Type	Categories	Number of holders	number of heads	% the number of holders	% the number of heads	Geometric mean	Adjust geometric mean	Number of selected holders	Fraction of sampling
Sheep	less than 5 heads	1782	6254	80	49.92	63.19	66.63	80	(1)/(22)
	From 5 heads or more	446	6273	20	50	31.65	33.37	40	(1)/(11)
	Total	2228	12527	100	100	94.84	100	120	-
Goats	less than 5 heads	1288	3476	77.98	44.87	59.15	62.93	54	(1)/(24)
	From 5 heads or more	364	4271	22.02	55.13	34.84	37.7	32	(1)/(11)
	Total	1652	7747	100	100	93.99	100	86	-

**Where:** the sampling fraction = the number of holders selected for each village / the number of holders in the center.

**Source:** Directorate of Agriculture in Gharbia, **Animal Production Department records**, unpublished data.

**Table no (8):** Distribution of the research sample to the selected villages and categories of owners of sheep and goats.

Center	village	The first category (less than 5 heads)					The second category (from 5 heads and more)				
		holders		heads		Number of selected holders	holders		heads		Number of selected holders
		Number	%	Number	%		Number	%	Number	%	
Qutour Center	Ibshway	1037	58.2	3651	58.37	47	93	20.8	2233	35.6	8
	Sajeen El-Kom	202	11.3	720	11.51	9	185	41.5	2315	36.9	17
Tanta center	Shagraf	274	15.4	912	14.58	12	105	23.5	1054	16.8	9
	Nawaj	269	15.1	971	15.54	12	63	14.2	671	10.7	6
Total		1782	100	6254	100	80	446	100	6273	100	40
Samanoud Center	Raheeben	775	60.2	2055	59.1	32	72	19.88	1489	34.8	6
	Azizia	156	12.1	418	12.03	7	146	40.25	1574	36.8	13
Tanta center	Sberbay	205	15.9	482	13.87	9	84	22.94	688	16.1	8
	Nawaj	152	11.8	521	15	6	62	16.93	520	12.1	5
Total		1288	100	3476	100	54	364	100	4271	100	32

**Source:** Directorate of Agriculture in Gharbia, **Animal Production Department records**, published data.

**Table no (9):** Indicators of productive efficiency of head fattening of sheep and goats in the tenure categories of the research sample.

Type	Type Statement	The first category (less than 5 heads)	The second category (from 5 heads and more)
Sheep	The number of fattened heads of the first category	186	236
	Average buying weight per head (kg live weight)	25.30	23.12
	Average selling weight of a head (kg live weight)	74.77	71.87
	Average fattening period per day (cycle)	137	130
	Average weight gain of the fattened head (kg)	49.47	48.75
	Daily growth rate (kg)	0.36	0.38
Goats	The number of fattened heads of the first category	100	166
	Average buying weight per head (kg live weight)	20.89	20.45
	Average selling weight of a head (kg live weight)	56.56	57.80
	Average fattening period per day (cycle)	100	93
	Average weight gain of the fattened head (kg)	35.67	37.35
	Daily growth rate (kg)	0.36	0.40

**Source:** collected and calculated from the field sample data for the year 2020/2021.

## **B: Indicators of price efficiency for fattening sheep and goats in the tenure categories of the research sample:**

Production costs and returns are among the most important economic indicators that show the extent of success achieved by economic units from an economic point of view. Production costs mean the total expenditure of the production facility on acquiring the resources that it uses in the production process. The profitability indicators of sheep or goats are affected by many factors. Whether it has a direct or indirect impact, and perhaps the most important of these factors is an increase or decrease in production costs and total revenue. Therefore, the research was interested in studying the most important items of costs and returns and the extent to

which they are affected by capacity returns by studying the data of the tenure categories in the research as follows: -

### 1- The economic costs and returns of fattening the head of sheep in the first category in the research sample:-

The data in Table no (10) shows the items of the average total variable costs of fattening the head of sheep during one fattening cycle in the first category in the research sample. The head of sheep at the beginning of the fattening cycle was estimated at 1588.70 pounds, equivalent to about 33.46% of the total variable costs of the head, and the cost of the consumed feed was estimated at 1485.77 pounds, equivalent to about 31.29%, while the cost of human labor used amounted to about 831.66 pounds, equivalent to about 17.51, the other costs, which include the cost of training, bedding, veterinary care, treatment, consumption of water, electricity, fuel, maintenance and repair, were estimated at 742.50 pounds, equivalent to about 15.46%. The sheep during the fattening cycle in the first category achieved a net income of about 501.81 pounds, and a total of about 501.81 pounds. The return per the total costs was about 1.11, and the return on the invested pound was about 0.11 pounds, and the fixed costs for the head of sheep amounted to about 60.23 pounds (includes the annual depreciation premium for buildings and tools c) The total costs amounted to about 4808.86 pounds.

### 2- The economic costs and returns of fattening the head of sheep in the second category in the research sample:

The data in Table no (10) shows the items of the average total variable costs of fattening the head of sheep during one fattening cycle in the second category in the research sample. The purchase of a head of sheep at the beginning of the fattening cycle was estimated at 1492.50 pounds, equivalent to about 38.30% of the total variable costs of the head, and the cost of the consumed fodder was estimated at 953.16 pounds, equivalent to about 24.46%, while the cost of human labor used amounted to about 649.80 pounds, equivalent to about 16.67. The other costs, which include the cost of training, bedding, veterinary care, treatment, consumption of water, electricity, fuel, maintenance and repair, were estimated at 801.63 pounds, equivalent to about 20.57%. The sheep during the fattening cycle in the second category achieved a net income of about 930.53 pounds, and a total of The return per the total costs was about 1.24, and the return on the invested pound was about 0.24 pounds, and the fixed costs of sheep were about 58.45 pounds (includes the annual depreciation premium for buildings and farms tools) and the total costs amounted to about 3,955.55 pounds.

**Table no (10):** Indicators of price efficiency for fattening the head of sheep in the tenure categories of the research sample: (Pounds)

Type Statement	The first category (less than 5 heads)	The second category (from 5 heads and more)
The cost of buying the head	1588.70	1492.50
Feed cost	1485.77	953.16
The cost of human labor wages	831.66	649.80
Other expenses(*)	742.50	801.63
Total variable costs	4748.63	3897.10
Total fixed costs	60.23	58.45
Total costs	4808.86	3955.55
The average selling price for a head after fattening	5268.57	4836.16
Total revenue from the sale of the head after fattening	5310.67	4886.08
Net yield for the head after fattening	501.81	930.53
The selling price of the kilogram, after fattening	70.46	67.29
Production cost per kilogram based	63.89	49.33
Total return for total costs	1.11	1.24
The return on the invested pound (profitability) per cycle	0.11	0.24
The return on the invested pound (profitability) per year	0.29	0.67

**Source:** collected and calculated from the field sample data for the year 2020/2021.

### 3- The economic costs and returns for the head of goats fattening in the first category in the research sample:

By studying the data contained in Table no (11) which includes the items of the average total variable costs of the head of goats during one fattening cycle in the first category in the research sample, it was found that the average variable costs of the head of fattened goats in the fattening cycle in this category amounted to about 3262.79 pounds, representing an item the cost of buying a head of goats at the beginning of the fattening cycle was about 1090.60 pounds, equivalent to about 33.43% of the total variable costs of the head, and the cost of the consumed feed was estimated at 757.78 pounds, equivalent to about 23.22%, while the cost of human labor used was about 580.81 pounds, equivalent to about 17.80%, and other costs, which include the cost of training, bedding, veterinary care, treatment, consumption of water, electricity, fuel, maintenance and repair,



were estimated at 833.61 pounds, equivalent to about 25.55%. The head of goats during the fattening cycle in the first category achieved a net income of about 317.14 pounds, The total return per the total costs was estimated at about 1.10, the return on the invested pound was about 0.10 pounds, the fixed costs were about 58.81 pounds, and the total costs for the head of goats were about 332 1.60 pounds, respectively.

#### 4- Economic costs and returns for fattening the head of goats in the second category in the research sample:

By studying the data contained in Table no (11) which includes the items of the average total variable costs of the head of goats during one fattening cycle in the second category in the research sample, it was found that the average variable costs of the head of fattened goats in the fattening cycle in this category amounted to about 3063.74 pounds, representing an item the cost of buying a head from goats at the beginning of the fattening cycle was about 1061.67 pounds, equivalent to about 34.65% of the total variable costs of the head. 16.73%, and other costs, which include the cost of arrangement, bedding, veterinary care, treatment, consumption of water, electricity, fuel, maintenance and repair were estimated at 812.18 pounds, equivalent to about 26.51%. The head of goats during the fattening cycle of the first category achieved a net income of about 525.27 pounds, and a total amount the return per total costs was about 1.17, and the return on the invested pound was about 0.17 pounds, and the total and fixed costs of the goat head amounted to 56.73 and 3120.48 pounds, respectively.

**Table no (11):** Indicators of price efficiency for fattening the head of goats in the tenure categories of the research sample: (Pounds)

Type Statement	The first category (less than 5 heads)	The second category (from 5 heads and more)
The cost of buying the head	1090.60	1061.67
Feed cost	757.78	677.37
The cost of human labor wages	580.81	512.53
Other expenses(*)	833.61	812.18
Total variable costs	3262.79	3063.74
Total fixed costs	58.61	56.73
Total costs	3321.60	3120.48
The average selling price for a head after fattening	3598.20	3590.87
Total revenue from the sale of the head after fattening	3638.74	3645.75
Net yield for the head after fattening	317.14	525.27
The selling price of the kilogram, after fattening	63.62	62.13
Production cost per kilogram based	60.90	53.61
Total return for total costs	1.10	1.17
The return on the invested pound (profitability) per cycle	0.10	0.17
The return on the invested pound (profitability) per year	0.37	0.67

Source: collected and calculated from the field sample data for the year 2020/2021.

#### (Sixth): The effect of capacity returns on costs and economic returns from fattening sheep and goats in the research sample:

To study the effect of capacity returns on costs and economic returns from fattening sheep and goats in the research sample, statistical hypothesis tests were used between groups for the research sample by using the T-test to measure the difference between the averages of all economic indicators as follows: -

##### 1 - Testing the significance of the differences between the average cost of a head of sheep in the two categories of the research sample:

By studying the data contained in Table no (12), which includes the difference between the items of the average total variable costs for a head of sheep during one fattening cycle in the two categories of the research sample, it was found that the difference of the average variable costs for a head of fattened sheep in the fattening cycle in the two research categories amounted to about 851.5 pounds, The significance of this difference was statistically proven at the level of significance 0.01, where the value of (t) was about 9.40, and it represents the difference in the item cost of buying the head of sheep at the beginning of the fattening cycle by about 96.2 pounds, and the significance of this difference was not statistically proven when the value of (t) reached about 1.63, and the difference in the cost of the consumed fodder was estimated at 532.6 pounds, and this difference was statistically proven to be at a level of significance 0.01 where the value of (t) reached about 8.77, while the difference in the cost of human labor used amounted to about 181.9 pounds, and this difference has been statistically proven to be significant. At a significant level of 0.01 where the value of (t) was about 5.09, and the difference was estimated for the item of other costs, which includes the cost of the cost of training, bedding, veterinary care, treatment, consumption of water, electricity, fuel, maintenance and repair by about 40.9 pounds, and this difference was statistically significant. At the level of significance 0.01, where the value of (t) was about 2.54, and the difference for items of fixed and total costs of the head of sheep amounted to 1.8 and 853.3 pounds, respectively. The value of (t) was about 2.40 and 9.39, respectively.

## 2- Testing the significance of the differences between the average head returns of sheep in the two categories of the research sample:

The data in Table no (12) also shows that the sheep during the fattening cycle of the first and second category achieved a net return of about 501.81 and 930.53 pounds, respectively, representing the difference between them about 428.7 pounds, where value of (T) was about 4.27, and the total return per total costs for the two categories was estimated at 1.11, 1.24, respectively, representing the difference between them about 0.13, and the significance of this difference was statistically proven at the level of significance 0.01, Where the value of (t) was about 4.96, and the return of the pound invested for the two categories was about 0.11 and 0.24 pounds, respectively, and the difference was statistically significant at a level of 0.01 where the value of (t) was about 4.96.

## 3- Testing the significance of the differences between the averages costs of a head of goats in the two categories of the research sample:

By studying the data contained in Table no (13) which includes the difference between the items of the average total variable costs of a head of goats during one fattening cycle in the two categories of the research sample, it was found that the difference of the average variable costs of a head of fattened goats in the fattening cycle in the two research categories amounted to about 199.1 pounds, the significance of this difference was statistically proven at the level of significance 0.01 where the value of (t) was about 3.27, and it represents the difference in the item cost of buying the head from goats at the beginning of the fattening cycle by about 28.9 pounds, and the significance of this difference was not statistically proven, as the value of (t) reached about 1.25, and the difference in the cost of the consumed fodder was estimated at 80.4 pounds, and this difference was statistically significant at the level of significance 0.05, where the value of (t) was about 2.22, while the difference in the cost of human labor used amounted to about 68.3 pounds, and this difference was statistically significant at the level of Significant 0.05, where the value of (t) was about 2.25, and the difference was estimated for the item of other costs, which includes the cost of training, litter, veterinary care, treatment, consumption of water, electricity, fuel, maintenance and repair by about 21.4 pounds, and this difference was not statistically significant, as it reached The value of (t) is about 1.15. The difference for items of fixed and total costs of a head of goats amounted to 2.08 + 201.1 pounds, respectively, and the significance of this difference for fixed costs was not proven, while the significance of this difference was statistically proven for total costs at a significant level of 0.01 where the value of (t) was about 1.70 + 3.29.

**Table no (12):** The average cost of a head of sheep in the tenure categories of the research sample during the fattening cycle: (Pounds)

cost items	The first category (less than 5 heads)		The second category (from 5 heads and more)		the difference		
	the value	%	the value	%	the value	T. value	Sig
The cost of buying the head	1588.70	33.46	1492.50	38.8	96.2	1.63	-
Feed cost	1485.77	31.29	953.16	24.46	532.6	8.77	**
The cost of human labor wages	831.66	17.51	649.80	16.67	181.90	5.09	**
Other costs(*)	742.50	15.64	801.63	20.57	40.9	2.54	**
Total variable costs	4748.63	100	3897.10	100	851.5	9.40	**
Total fixed costs	60.23	-	58.45	-	1.8	2.40	*
Total costs	4808.86	-	3955.55	-	853.3	9.39	**
Total revenue	5310.67	-	4886.08	-	424.6	4.40	**
net revenue	501.81	-	930.53	-	428.7	4.27	**
Total revenue / total Costs	1.11	-	1.24	-	0.13	4.96	**
The return on the invested pound	0.11	-	0.24	-	0.13	4.96	**

Where:

Net revenue = total revenue - total costs.

Return on the invested pound = (net revenue / total production costs).

% of total return/ total costs = (total revenue / total production costs) x 100.

T-value: It was calculated by t-test in groups.

\*: significant at 0.05, \*\*: significant at 0.01.

(\*): includes the cost of training, veterinary care, water and electricity consumption, maintenance and repair.

Source: collected and calculated from the field sample data for the year 2020/2021.

## 4- Testing the significance of the differences between the average head yield of goats in the two categories of the research sample:

The data in Table no (13) also shows that the head of goats during the fattening cycle of the first and second category achieved a net income of about 317.14 and 525.27 pounds, respectively, representing the difference between them about 208.1 pounds, where the value of (T) was about 2.40, and the total return per the

total costs for the two categories was estimated at 1.10 + 1.17, respectively, the difference between them represented about 0.07, and the significance of this difference was statistically proven at the level of significance 0.01, where the value of (T) was about 2.50, and the return of the invested pound for the two categories was about 0.10 and 0.17 pounds, respectively, and the significance of this difference was statistically proven at the level of significant 0.01 where the value of (t) was about 2.50.

**Table no (13):** The average cost of a head of goats in the tenure categories of the research sample during the fattening cycle: (Pounds)

cost items	The first category (less than 5 heads)		The second category (from 5 heads and more)		the difference		
	the value	%	the value	%	the value	T . value	Sig
The cost of buying the head	1090.60	33.43	1061.67	34.65	28.9	1.25	-
Feed cost	757.78	32.22	677.37	22.11	80.4	2.22	*
The cost of human labor wages	580.81	17.80	512.53	16.73	68.3	2.25	*
Other costs(*)	833.61	25.55	812.18	26.51	21.4	1.15	-
Total variable costs	3262.79	100	3063.74	100	199.1	3.27	**
Total fixed costs	58.81	-	56.73	-	2.08	1.70	-
Total costs	3321.60	-	3120.48	-	201.1	3.29	**
Total revenue	3638.74	-	3645.75	-	7	0.08	-
net revenue	317.14	-	525.27	-	208.1	2.40	*
Total revenue / total Costs	1.10	-	1.17	-	0.07	2.50	**
The return on the invested pound	0.10	-	0.17	-	0.07	2.50	**

**Where:** net revenue = total revenue - total costs.

Return on the invested pound = (net revenue / total production costs).

% of total return/ total costs = (total revenue / total production costs) x 100.

T-value: It was calculated by t-test in groups.

\*: significant at 0.05, \*\*: significant at 0.01.

(\*): includes the cost of training, veterinary care, water and electricity consumption, maintenance and repair.

**Source:** collected and calculated from the field sample data for the year 2020/2021.

## VI. Conclusion

The research conclude that work must be done on reduce the prices of production requirements for sheep and goat farms, especially feed prices, which represent about 31.29% and 24.86% of the variable costs of fattening the head of sheep in the two research categories, respectively, and about 32.22% and 22.11% for the first and second categories of goats, respectively, and encourage investors to pump new money into the sheep and goat meat production and fattening sector to push forward the investment indicators in them, which have clearly decreased in two categories of goats respectively, and Working to spread and encourage the breeding of sheep and goats in large herds to benefit from the returns of capacity, as the total costs of fattening the head of sheep decreased from about 4808.86 pounds in the first category to about 3,955.55 pounds in the second category, and for goats from about 3321.60 pounds for the first category to about 3120.48 pounds for the second category.

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