



The economic dimension of camels in achieving food security from red meat in Egypt

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Abstract: The main problem of the research is based on the inability of red meat production capacity to meet the increasing needs for it, as self-sufficiency was estimated at about 63% in 2021. With the increase in population numbers, demand has increased, which has resulted in a decrease in per capita income year after year. In light of the competition between human food and livestock feed for cultivated area, and the high prices of dry feed, it was necessary to search for other sources to enhance animal protein production that are able to adapt to the conditions of feed shortage and high prices. Here the importance of camels appears, due to their ability to diversify their food sources and their tolerance of quantitative and qualitative food shortages. The research then aimed to evaluate the current situation of food security from red meat, and to what extent camel breeding affects reducing the gap in red meat. The most important results were the following: : A decrease in the number of live animals producing red meat, the total production, and the per capita share of red meat during the period (2008-2021), While the amount of red meat imports and the percentage of dependence on imports increased, while national consumption was relatively stable, Then the rate of self-sufficiency decreased, while both the quantities of camel meat produced and the numbers of camels increased, while the amount of camel meat imports and the numbers of imported camels slaughtered decreased. Hence, the most important recommendations were to establish large camel breeding stations, in addition to providing all forms of technical, awareness and guidance support. And communicating directly with the groups of educators located near each station, in order to improve their capabilities and overcome any obstacles that may hinder their efforts, This is helped by dividing and classifying the desert, especially the desert backs of the governorates, into a number of levels in terms of the availability of grazing resources, as well as the preservation of natural resources and limiting their deterioration.

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Introduction:

The problem of food security in general and animal proteins in particular is one of the most important problems facing the national economy. Which was represented by decreasing production, increasing demand, and rising prices. The most important of which is red meat . This means the need to enhance production to meet increasing consumption And gradually dispensing with imports, to reduce the gap that is widening year after year, as the gap in red meat reached about 323 thousand tons in 2021, The average per capita consumption in 2021 was estimated at about 6.8 kg/year, which is less than the minimum recommended per capita by the World Health Organization of about 25.5 kg/year, which ensures combating malnutrition and ensuring healthy growth. In light of the competition between human food and livestock feed over the cultivated area, the rise in dry feed prices, and the increase in the import bill for feed ingredients, It was necessary to search

for other sources to enhance the production of animal protein from varieties capable of adapting to conditions of feed shortage and high prices. Here the importance of camels appears, due to their ability to diversify their food sources and to tolerate quantitative and qualitative shortages in food, and other forms of adaptation, which puts them in permanent balance with the environment. Hence, camels can contribute to increasing the production of red meat by exploiting dry and semi-arid areas without competing with other livestock, Such as specific areas adjacent to it. However, camels have not yet received sufficient attention to exploit their potential economically. This may be due to unfair productivity comparisons between camels and other livestock, without taking into account the environmental conditions of their respective production areas, The high costs of raising other animals, the scarcity of agricultural land compared to the area of desert land, as well as the impact of

climate change on the increase in arid and semi-arid areas.

Problem:

The main problem is based on the inability of the red meat production capacity to meet the increasing needs for it, as self-sufficiency in red meat was estimated at about 63% in 2021, and with the increase in population numbers, the demand for it has increased, which has resulted in a decrease in the per capita share year after year. It decreased from about 8.1 kg/year in 2019, to about 7.3 kg/year in 2020, then decreased to about 6.8 kg/year in 2021, and the impact of this is reflected in the continuous rise in its prices and the widening of the food gap, and the imports that this requires. It increases the depletion of foreign exchange resources.

Objective:

The research aims to evaluate the current situation of food security from red meat, and to what extent camel breeding affects reducing the gap in red meat and achieving sustainable development. This is achieved by achieving a set of sub-objectives: Studying the local production of red meat, as well as consumption, and the size of the apparent and real gap, as well as identifying the most important factors affecting the production of red meat in Egypt in general and camel meat in particular.

Method and data sources:

The research method was based on descriptive and quantitative analysis of statistical data, and many analytical tools and statistical methods were used. Which is represented by a gradual regression analysis, as well as some economic methods and indicators associated with analyzing the level of food security. SWOT analysis was also used to achieve the goal of the research. The research relied mainly on secondary published and unpublished data from various sources, such as data from the Economic Affairs Sector of the Ministry of Agriculture, bulletins of the Central Agency for Public Mobilization and Statistics. In addition to research and studies related to the research topic.

Results and Discussion:

First: The development of the most important indicators of the current status of red meat:

1- Numbers of live animals producing red meat:

It is clear from Tables (1) and (2) that the average number of heads of livestock (cows, buffalo, sheep, goats, camels) during the period (2008-2021) amounted to about 15.89 million heads, with a minimum of about 7,031 thousand heads in 2020, and the Maximum about 19.15 million heads in 2008. It was also shown that the number of livestock heads decreased annually by about 874.5 thousand heads, with an annual change rate of about -5.50%.

2- Red meat production: T

The average local production of red meat during the study period was estimated at about 745.1 thousand tons, with a minimum of about 512 thousand tons in 2020, and a maximum of about 981 thousand tons in 2009. The results showed a decrease in production by about 30.5 thousand tons annually, with an annual rate of change of -4.09%. This decline may be attributed to the decrease in livestock numbers, as well as the relative stability of the areas of sustainable alfalfa and green fodder, and the decrease in the areas of alfalfa for plowing and raising, during that period.

3- National consumption of red meat:

It is clear from Table (1) that the maximum consumption of red meat during the study period amounted to about 1,407 thousand tons in 2015, while the minimum amounted to about 878 thousand tons in 2021, with an average amount of about 1,117.6 thousand tons. By estimating the coefficient of variation, it was found that consumption amounts dispersed very slightly around their average during the study period, by about 12.5%. This indicates relative stability in the quantities available for consumption, which is also confirmed by the time trend results in Table (2).

4- Red meat imports:

The results of Table (1) indicate an increase in red meat imports during the study period, as the minimum reached about 215 thousand tons in 2009, and the maximum reached about 631 thousand tons in 2018, and the average was estimated at about 378.4 thousand tons. This is confirmed by the results of the time trend in Table (2), which shows an increase in red meat imports annually by about 17.23 thousand tons, with an annual rate of change of 4.5%.

5- Reliance on imports of red meat:

This indicator measures the level of political and economic dependency on other countries, as it is clear from Table (1) that the average percentage of dependence on imports during the study period was about 33.3%, with a minimum of about 18% in 2009, and a maximum of about 49.4% in 2018. By estimating the general time trend, as shown in Table (2), it was found that the percentage of dependence on foreign countries increased annually by about 2.13%, that is, representing about 6.4% of the average percentage of dependence during the study period. The risks of relying on imports are that instability in import prices inevitably leads to instability in the import bill, and the severity of the risk increases in the event of global crises that affect the global supply of food commodities.

Table (1): Development of the number of livestock producing red meat, total production, consumption, imports, per capita, and the percentage of reliance on imports of red meat in Egypt during the period (2008-2021).

Years	Numbers of livestock (thousand heads)	Total production (thousand tons)	Consumption (thousand tons)	Imports (thousand tons)	%dependence on imports	Average per capita (kg/year)
2008	19154	961	1176	307	18.3	10.9
2009	18232	981	1196	215	18	10.9
2010	18363	791	1052	261	24.8	9.8
2011	18523	787	1033	240	23.8	9.4
2012	18989	788	1052	309	25.1	9.2
2013	18530	780	1118	338	30.2	9.7
2014	18557	769	1223	388	37.1	10.1
2015	18247	796	1407	615	43.4	11.4
2016	18370	791	1167	373	32.2	9.2
2017	17252	737	1155	418	36.2	8.7
2018	16309	639	1263	631	49.4	10.2
2019	7384	544	1003	474	45.8	8.1
2020	7031	512	924	406	44.6	7.3
2021	7546	555	878	323	36.8	6.8
Average	15891.9	745.1	1117.6	378.4	33.3	9.4
Minimum	7031	512	878	215	18	6.8
Limit	19154	981	1407	631	49.4	11.4
%Factor difference	29.6	18.9	12.5	33.2	31	14.2

Available for consumption = production + inventory difference (imports - exports).

.dependence on imports = (consumption - production) / consumption * 100 %

Source: Collected and calculated from data from the Ministry of Agriculture and Land Reclamation, Central Administration of Agricultural Economics, Food Balance Bulletins, consecutive issues.

Table (2): General time trend equations for the development of livestock numbers, total production, consumption, imports, per capita, and the percentage of dependence on imports of red meat in Egypt during the period (2008-2021).

Variables	Unit	A	B	T	R ²	Rate of change %
Numbers of livestock	(thousand heads)	22450.7	874.5-	4.29**	0.6	5.50-
Domestic production of red meat	(thousand tons)	974	30.5-	**7.5	0.82	4.09-
Consumption of red meat	(thousand tons)	1197.6	10.66-	1.17	0.1	-
Red meat imports	(thousand tons)	249.19	17.23	*2.4	0.32	4.5
Percentage of dependence on imports	(%)	17.29	2.13	**5.9	0.75	6.4
Per capita red meat	(kg/year)	11.14	0.23-	**3.6	0.52	2.46-

(**) significant at the 0.01 level, (*) significant at the 0.05 level.

Source: Collected and calculated from: Data from Table No. (1).

6- Per capita share of red meat:

It is clear from Tables (1) and (2) that the average per capita intake of red meat amounted to about 9.4 kg/year during the study period, with a minimum of about 6.8 kg/year in 2021, and a maximum of about 11.4 kg/year in 2015. It was also shown that the per capita share decreased annually, estimated at about 0.23 kg/year, with an annual rate of change of - 2.46%. This decrease may be attributed to the increasing population numbers, as well as the relative stability of the quantities of red meat available for consumption during that period.

Second:

The current situation of the nutritional gap in red meat:

It is important to distinguish between two types of gap: The first is the apparent gap, which means the difference between the production of red meat and the amount available for consumption. And the second is the real or objective gap, which reflects the extent to which the quantities produced are sufficient in quantity and quality to meet the actual needs of consumption. Real needs are determined according to three criteria: The first is the minimum recommended

by the World Health Organization, the second is the average limit, which is the average per capita consumption globally, and the third is the optimal limit, which is calculated on the basis of the average per capita consumption in developed countries. In estimating the real gap, the study relied on the first criterion, which is the minimum recommended per capita by the World Health Organization, and then the study focused on comparing real consumption with its estimated counterpart.

1- The apparent gap:

It is clear from Tables (3) and (4) that the average size of the apparent gap in red meat during the period (2008-2021) amounted to about 372.6 thousand tons, with a minimum of about 215 thousand tons in 2009, and a maximum of about 624 thousand tons in 2018. It was also shown that the size of the gap increased annually by about 19.87 thousand tons, with an annual change rate of 5.3%.

2- The real gap:

The average size of the real gap during the study period was estimated at about 1511.9 thousand tons,

with a minimum of about 956.3 thousand tons in 2008, and a maximum of about 2047.56 thousand tons in 2021. The results also showed an increase in the size of the real gap annually by about 86.2 thousand tons at an annual rate of change of 5.7%, as shown in Tables (3) and (4), which shows that the real gap is much larger than the apparent gap. That is, consumption according to international standards is greater than its apparent counterpart, which means the existence of a food deficit, and then this deficit must be addressed in a way that helps achieve food security.

3- Virtual self-sufficiency: The data in Table (3) indicate that the average percentage of self-sufficiency in red meat during the study period was estimated at about 66.7%, and the minimum was about 50.6% in 2018, and the maximum was about 82% in 2009. By estimating the general time trend as shown in Table (4), the self-sufficiency rate was reduced annually by about 2.13%.

Table (3): Evolution of the size of the apparent and real gap, apparent and real self-sufficiency, real needs for red meat, and population in Egypt during the period (2008-2021).

the years	The size of the apparent gap (thousand tons)	The size of the real gap (thousand tons)	apparent % self-sufficiency rate	self- real% sufficiency rate	Real needs (thousand tons)	population million one (population)
2008	215-	956.35-	81.7	50.12	1917.35	75.19
2009	215-	978.17-	82	50.07	1959.17	76.83
2010	261-	1215.3-	75.2	39.43	2006.34	78.68
2011	246-	1266.5-	76.2	38.32	2053.52	80.53
2012	264-	1317-	74.9	37.43	2105.03	82.55
2013	338-	1378.1-	69.8	36.14	2158.07	84.63
2014	454-	1444.7-	62.9	34.74	2213.66	86.81
2015	611-	1472.5-	56.6	35.09	2268.48	88.96
2016	376-	1530-	67.8	34.08	2321.01	91.02
2017	418-	1690.6-	63.8	30.36	2427.6	95.2
2018	624-	1838.3-	50.6	25.79	2477.33	97.15
2019	459-	1978-	54.2	21.57	2521.95	98.9
2020	412-	2053.4-	55.4	19.96	2565.4	100.6
2021	323-	2047.6-	63.2	21.33	2602.56	102.06
Average	372.6-	1511.9-	66.7	33.9	2257	88.5
Minimum	215-	956.35-	50.6	19.96	1917.35	-
Limit	624-	2047.6-	82	50.12	2602.56	-
Factor % difference	35.8	24.2	15.4	28.1	10.4	10.4

The numbers between parentheses are negative. A The real gap = production - real needs.

P parent gap = production - available for consumption.

Apparent sufficiency ratio = (production / available for consumption) x 100.

Real self-sufficiency ratio = (production/consumption) x 100.

Real needs = population x 25.5 kg/year.

Source: Collected and calculated from data from the Ministry of Agriculture and Land Reclamation, Central Administration for Agricultural Economics, Food Balance Bulletins, consecutive issues

4- True self-sufficiency:

It is clear from Tables (3) and (4) that the true self-sufficiency rate reached about 33.9% during the study period, with a minimum of about 19.9% in 2020, and a maximum of about 50.12% in 2008. It was also shown that the real self-sufficiency rate decreased annually by about 2.18%, which represents about 6.45% of the average self-sufficiency rate during the study period. From the above, it is clear that the noticeable decline in the self-sufficiency rate, whether apparent or real, in the recent period, may be due to the decline in red meat production, which was

reflected in the increase in the size of the gap between production and consumption.

5- Real needs:

The average real need for red meat during the study period was estimated at about 2,257 thousand tons, and the minimum was about 1,917 thousand tons in 2008, and the maximum was about 2,602.56 thousand tons in 2021. The results also showed an increase in real needs annually by about 55.7 thousand tons, with an annual change rate of 2.47%, and this is indicated by the decrease in the average per capita share of red meat.

Table (4): General time trend equations for the evolution of the size of the apparent and real gap, apparent and real self-sufficiency, and real needs for red meat in Egypt during the period (2008-2021).

Variables	Unit	A	B	T	R ²	Rate of change %
The apparent gap of red meat	thousand tons	223.5	19.87	**2.75	0.39	5.33
The real gap from red meat	thousand tons	865	86.2	**20.4	0.97	5.7
Apparent self-sufficiency rate	%	82.7	2.13-	**5.9	0.75	3.19-
True self-sufficiency rate	%	50.29	2.18-	**12.1	0.92	6.45-
The real needs of red meat	thousand tons	1839	55.7	**45.7	0.99	2.47

(**) significant at the 0.01 level, (*) significant at the 0.05 level.

Source: Collected and calculated from: Data from Table No. (2).

Third:**The current status of the most important food security indicators of red meat:**

- 1- **Daily consumption of red meat:** The results presented in Table (5) showed that the average daily consumption reached 3.1 thousand tons during the study period, with a maximum of about 3.85 thousand tons in 2015 and a minimum of about 2.41 thousand tons in 2021.
- 2- **The period of sufficient production for consumption:** The average period of sufficient production for red meat consumption was estimated at about 244 days during the study period, with a maximum of about 2.99 days in 2009 and a minimum of about 185 days in 2018.
- 3- **Import sufficiency period:** The results of Table (5) indicate that the average period of sufficiency of imports for red meat consumption was about 123 days during the study period, with a maximum of 182 days in 2018 and a minimum of 66 days in 2009.
- 4- **Change in the size of the strategic stock of red meat:** The average change in stock size was estimated at about 5.9 thousand tons during the study period, with a maximum of 92 thousand

tons in 2008 and a minimum of 66 thousand tons in 2014.

- 5- **The value of the food security factor:** The average value of the food security factor for red meat was estimated at about 0.005 during the study period, with a maximum of about 0.078 in 2008 and a minimum of about -0.006 in the years 2011 and 2020.

Fourth: The quantitative and relative changes that occurred in red meat production in general and camel meat production in particular:

The results of Table No. (6) indicate a decrease in red meat production from about 861.6 thousand tons during the base period (2008-2012) to about 597.4 thousand tons during the comparison period (2017-2021), with a decrease rate of about -30.7%. This decrease in production quantities is attributed to a decrease in the total number of livestock (excluding the number of camels), as it decreased from about 18,525.4 thousand heads to about 10,974.6 thousand heads, a decrease rate of about -40.8%, as well as an increase in the import of red meat from about 266.4 thousand tons during The base period reached about 450.4 thousand tons during the comparison period, an increase of about 69.1%.

While the results showed an increase in camel meat production from about 8.2 thousand tons during the base period to about 14.4 thousand tons during the comparison period, an increase of about 75.6%. This increase is attributed to the increase in the number of camels, as it was shown that the numbers increased from about 126.8 thousand heads to about 129.8 thousand heads, an increase of about 2.4%, in addition to the decrease in imports of camel meat.

The results showed a decrease in imports from about 19.2 thousand tons to about 6.6 thousand tons, with a decrease rate of about - 65.6%. The results also indicated a decrease in the number of slaughtered imported camels from about 113,845.4 heads to about 39,412.2 heads, with a decrease rate of about - 34%. This was reflected in the volume of local production of camel meat.

Table (5): Evolution of consumption, periods of production efficiency, import coverage, strategic stocks, and food security factors of red meat during the period (2008-2021).

the years	Daily consumption (thousand tons)	The period of sufficient production for consumption per day	Import coverage period for consumption per day	The total of the two periods per day	Change in the size of strategic stock	Food security factor value
2008	3.22	298	95	394	92	0.078
2009	3.28	299	66	365	0	0
2010	2.88	274	91	365	0	0
2011	2.83	278	85	363	6-	0.006-
2012	2.88	273	107	381	45	0.043
2013	3.06	255	110	365	0	0
2014	3.35	230	116	345	66-	0.054-
2015	3.85	206	160	366	4	0.003
2016	3.2	247	117	364	3-	0.003-
2017	3.16	233	132	365	0	0
2018	3.46	185	182	367	7	0.006
2019	2.75	198	172	370	15	0.015
2020	2.53	202	160	363	6-	0.006-
2021	2.41	231	134	365	0	0
Average	3.1	244	123	367	5.9	0.005
Minimum	2.41	185	66		66-	
Limit	3.85	299	182		92	0.078
Factor % difference	12.5	15.4	28.4	2.9	574.8	534.4

Daily consumption = total consumption / 365 days.

Period of sufficient production for consumption = total domestic production/daily consumption.

Import coverage period for consumption = total imports/daily consumption.

The amount of strategic inventory size = the amount of surplus in consumption - the amount of deficit in consumption.

Food security factor value = (strategic stock / annual consumption quantity).

- The numbers between the parentheses are negative.

Source: Compiled and calculated from: Ministry of Agriculture and Land Reclamation - Economic Affairs Sector - Food Security Bulletin - various issues

Table (6) Changes in the production of red meat and camel meat between the periods (2008-2012) and (2017-2021).

Statement	Unit	Average period -2008) (2012)	Average period (2021-2017)	Quantitative change	Relative change (%)
Quantity of red meat production	(thousand tons)	861.6	597.4	264.2-	30.7-
Quantity of camel meat production	(thousand tons)	8.2	14.4	6.2	75.6
Quantity of red meat imports	(thousand tons)	266.4	450.4	184	69.1
Quantity of camel meat imports	(thousand tons)	19.2	6.6	12.6-	65.6-
Numbers of livestock without camels	(a thousand heads)	18525.4	10974.6	7550.8-	40.8-
Numbers of camels	(a thousand heads)	126.8	129.8	3	2.4
Number of camels slaughtered in slaughterhouses All government imported	(a thousand heads)	113.84	74.43	39.412-	34.6-

Source: Collected and calculated from: Data in Table No. (1) in the Appendix.

Fifth: Quantitative analysis of the most important factors affecting red meat production in general and camel meat production in particular:

1- Red meat:

2- The production capacity of red meat is determined by a set of economic and technical changes, and the relationship between the quantity of red meat produced in thousand tons as a dependent variable and the following independent variables was estimated: Number of livestock in 1000 heads, quantity of red meat imports in 1000 tons, production of sustainable alfalfa in 1000 tons, production of plowed alfalfa in 1000 tons, production of rearing alfalfa in 1000 tons, area of green fodder in acres, quantity of feed for fattening livestock in 1000 tons. A number of mathematical models were estimated using the stepwise regression method in an attempt to reach the best formulas representing the relationship between the quantity produced and the aforementioned independent variables. A comparison was made between these different mathematical models, and it was revealed that the best representation of this relationship according to economic and statistical logic, and after excluding the variables whose effects were not found to be significant or whose sign contradicts economic logic, is the double logarithmic form.

At this time, the most important factors affecting the amount of red meat production were the number of livestock per thousand heads, and the amount of red meat imports per thousand tons, as shown in Table No. (7), The results of the model estimation indicate that there is an inverse relationship between the quantity of red meat production and the quantity of

imports of it, and the value of the elasticity coefficient was -0.178, meaning that a change in the quantity of imports by 10% is accompanied by a decrease in the quantity of production by 1.78%. While the relationship was direct between the quantity of production and the number of livestock, and the elasticity coefficient was estimated at about 0.416, meaning that a change in the number of livestock by about 10% is accompanied by an increase in the quantity produced by about 4.16%.

3- Camel meat :

By studying and estimating the relationship between the amount of camel meat produced in thousand tons as a dependent variable and the following independent variables: Number of slaughtered imported camels, number of camels per thousand heads, number of livestock without camels per thousand heads, quantity of red meat imports per thousand tons, production of sustainable alfalfa per thousand tons, production of clover clover per thousand tons, production of rearing clover per thousand tons, area of green fodder per acre, and quantity of fodder. Broiler cattle per thousand tons.

It turns out that the most important factors affecting the amount of camel meat production are the number of camels and the number of slaughtered imported camels. The best representation of this relationship was the double logarithmic form, as shown in Table No. (7). It was then shown that there is a direct relationship between camel meat production and the number of camels, and the value of the elasticity coefficient was 0.73, meaning that a change in the number of camels by 10% is accompanied by an increase in camel meat production by 7.3%, while it

was shown that there is an inverse relationship between the amount of camel meat production and the number of camels slaughtered. The value of the elasticity coefficient was -0.88, meaning that a

change in the number of slaughtered imported camels by 10% is accompanied by a decrease in the quantity of camel meat production by 8.8%.

Table No. (7) Stepwise regression function for the most important factors affecting red meat production in general and camel meat production in particular during the period (2008-2021).

Dependent variable	Sample	F	R ²	D.W
Red meat production	$\ln Y_{i1} = 3.64 - 0.178 \ln X_1 + 0.416 \ln X_2$ *(2.5) **(7.2)	35.03	0.86	1.2
Camel meat production	$\ln Y_{i2} = 8.76 + 0.73 \ln X_3 - 0.88 \ln X_4$ *(2.0) *(2.2)	4.3	0.44	2.1

\hat{Y}_{i1} = Estimated quantity of red meat production in thousand tons., \hat{Y}_{i2} = Estimated quantity of camel meat production in thousand tons.

X_1 =Quantity of red meat imports in thousand tons., X_2 = Number of livestock per thousand heads.

X_3 = Number of camels per thousand heads., X_4 = The number of slaughtered camels is imported by the thousand heads.

(*) Significant at the 0.05 level. (**) Significant at the 0.01 level.

Source: Collected and calculated from data in Table No. (1). With the appendix

Sixth: Geographical distribution of the number of camel heads:

The data in Table (8) shows the relative importance of the number of camel heads in governorates in Egypt during the period (2019-2021), It was found that Aswan Governorate still ranks first for its contribution of about 65.39 thousand heads, representing about 47.9% of the total number of camels in the Republic during the aforementioned period, amounting to about 136.59 thousand heads. Matrouh Governorate comes in second place with about 18.65 thousand heads, representing about

13.7%, of the total in the Republic. Then come the governorates in terms of average and percentage of camel numbers: Sharqia (8.66, 6.3%), Giza (5.53, 4.1%), South Sinai (5, 3.7%), Qena (4.12, 3%), Beheira (3.67, 2.7%), Red Sea (3.61, 2.6%), Fayoum (2.78, 2%), Sohag (2.59, 1.9%), each respectively, Thus, the number of camel heads in the Republic is concentrated in the aforementioned governorates, where they represent about 87.9%, while the other governorates represent about 12.1% of the number of camels in the Republic.

Table No. (8) Geographical distribution of the number of camel heads in Egypt during the period (2019-2021).

Governorate	Numbers in thousands of heads	Relative importance %
Aswan	65.39	47.9
Subtracted	18.65	13.7
Eastern	8.66	6.3
Giza	5.53	4.1
South of Sinaa	5	3.7
Qena	4.12	3
the lake	3.67	2.7
The Red Sea	3.61	2.6
Fayoum	2.78	2
Sohag	2.59	1.9
Other governorates	16.57	12.14
Republic	136.59	100

Source: Collected and calculated from: data from the Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Livestock Statistics Bulletin, consecutive issues.

Seventh: SWOT analysis matrix

The camel is economically important as an animal that lives and produces under dry and hot conditions. It is important to rely on camel meat to fill the gap from red meat, especially in light of climate change that has led to higher temperatures and decreased water resources. There are three desert areas in Egypt: The Eastern Desert, located east of the Nile River and west of the Red Sea, contains the Red Sea mountains and some valleys. The second region is the Western Desert, which extends west of the Nile River and is characterized by the presence of the Bahariya, Kharga, Farafra, and Siwa oases. As well as the desert areas in the Sinai Peninsula, and these three areas represent about 95% of the area of Egypt. It is worth noting that most of the inhabitants of these deserts are Bedouins, and their primary occupation is herding and agriculture, and that the most common and used agricultural animal in those areas is camels, meaning that camel breeding is an essential element of the desert environment and one can benefit from their enormous production capacity. The data presented in Table (9) shows the most important elements of strength, elements of weakness, potential opportunities, potential threats or challenges, which interact with each other, pushing and pulling, with or against the possibility of relying on camels to achieve food security from red meat in Egypt, as this analysis helps To understand the decision-making process and provide a broad view of the existing scenario, Therefore, the primary purpose of using this analytical tool is to discover what can be enhanced, and the factors that must be monitored and controlled, so as not to negatively affect the goal.

Recommendations:

-The results indicated a decrease in local production of red meat during the study period, so it is important to work to increase this production in a way that reduces the risks of dependence on abroad and leads to an accumulation in the size of the strategic stock, Hence, increasing the value of the food security factor, and working to encourage investment and expand the establishment of beef cattle and buffalo fattening farms, and remove all financing problems facing producers, may be one of the important means of achieving this.

- The results showed an increase in local production of camel meat and the impact of developing its production on increasing the value of the food security factor, which may be achieved through the following:

- Establishing large camel breeding stations, as well as providing all forms of technical, awareness and guidance support, and communicating directly with the groups of breeders located near each station, in order to improve their capabilities and overcome any obstacles that may hinder their efforts, and the division and classification of the desert, especially the desert backside of the governorates, helps in this. To a number of levels in terms of the availability of grazing resources, as well as the preservation of natural resources and reducing their deterioration.
- Working to replace camel meat with imported meat used in the manufacture of meat products, and this may be through awareness programs or legal texts.
- Influencing the consumption pattern through awareness programs that work to change consumers' taste towards camel meat, or replace it with imported meat.

Table No. (9) shows the SWOT matrix regarding reliance on camels as a strategic asset for animal protein in Egypt.

	Strengths	Weaknesses
Internal sources	- Feeding costs for camels are lower compared to other livestock, as they feed on desert plants, in addition to lower costs for veterinary services, as diseases affecting camels are few and limited.	- The many marketing problems facing breeders, especially in remote and desert areas, as well as the lack of government services provided to breeders in those areas.
	- The superior ability of camels to adapt and produce under varying conditions, graze on plants with low nutritional value, and withstand thirst..	- Symptoms of diseases may not appear on infected camels.
	- Higher efficiency of camels in utilizing food compared to other livestock, especially fodder with poor nutritional content.	- With increasing age, camel meat becomes rough and tough and requires a longer time to cook, which explains the consumer's reluctance to eat its meat and the demand for meat from other livestock.
	- Camels do not require large costs to house them compared to other livestock.	
	-Higher cash returns from camel by-products compared to other livestock.	
	Opportunities	Challenges
External sources	- There are many suitable areas for raising camels (grazing) in the Egyptian desert, especially in Sinai, southeastern Egypt, Halayeb and Shalatin, and the northwestern coast of Matrouh, as well as the desert backlands of some governorates.	- The state bears some cash expenses, especially the costs of establishing a number of central camel breeding stations, as well as the costs of supplementary feed at some times of the year, in the case of following semi-intensive breeding systems.
	- The spread of Bedouins in most of the Egyptian desert, which means that local labor is available, cheap, trained, and highly efficient in raising camels, as herding and agriculture are the primary occupations for most of the residents of those areas.	- Rainfall rates have decreased in recent years, and some of its locations have changed, which means studying this matter well before determining the appropriate areas to establish central stations for camel breeding..

Source: Prepared by the researcher, according to a number of personal interviews with specialists and educators.

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Supplement:

Table (1) Total quantities of red meat and camel meat production, total imports of red meat and camel meat, total numbers of livestock, and numbers of camels slaughtered in Egypt during the period (2008-2021).

Yea	Quantity of red meat production (thousand tons)	Quantity of camel meat production (thousand tons)	Quantity of red meat imports (thousand tons)	Quantity of camel meat imports (thousand tons)	Numbers of livestock other than camels (a thousand heads)	Number of camels (a thousand heads)	The numbers of camels slaughtered in government slaughterhouses and slaughterhouses are all imported (a thousand heads)
2008	961	8	307	-	19047	107	90.5
2009	981	8	215	29	18095	137	114.12
2010	791	7	261	31	18252	111	150.24
2011	787	9	240	21	18386	137	113.67
2012	788	9	309	15	18847	142	100.7
2013	780	10	338	16	18377	153	62.3
2014	769	10	388	7	18399	158	68.4
2015	796	10	615	9	18094	153	83.26
2016	791	11	373	12	18263	107	89.48
2017	737	14	418	7	17097	155	79.07
2018	639	3	631	23	16224	85	93.96
2019	544	17	474	3	7293	91	68.53
2020	512	14	406	-	6952	79	52.57
2021	555	24	323	-	7307	239	78.04

Source:

- Collected and calculated from: data from the Ministry of Agriculture and Land Reclamation - Economic Affairs Sector - Food Security Bulletin - various issues.

- Collected and calculated from data from the Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Livestock Statistics Bulletin, consecutive issues.

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