

THE POTENTIAL CONTRIBUTION OF CAMEL MEAT PRODUCTION TO ACHIEVE FOOD SECURITY FROM ANIMAL PROTEIN IN EGYPT

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ABSTRACT: There is a growing gap between annual demand and available amount of animal protein in Egypt. Therefore, the paper aims to identify and analyze the factors that influence demand for camel meat and elements that reduce its consumption in order to guide policymakers to decide whether the consumption gap in red meat can be narrowed with camel meat. To achieve the paper's objective, a logistic regression analysis is employed. Data is obtained via field survey for Cairo Governorate (432 observations). Results indicate that there is a statistically significant relationship between camel meat consumption and gender, age, monthly household income, consumption and price of beef, camel meat price, fat and cholesterol contents and availability of camel meat. Finally, the study recommends that the government can develop proper marketing systems and channels for distributing and selling camel meat, via Ministry of Agriculture outlets, Ministry of Interior outlets, armed forces outlets, and consumer associations.

Key words: Camel meat – Consumption – Egypt – Food Security – Logistic regression.

INTRODUCTION

Globally, the combination of the Russia-Ukraine crisis and the COVID-19 pandemic has led to the worst food crisis since World War II, i.e., as many as 1.7 billion people are in famine and poverty (Lin *et. al.*, 2023). Food insecurity refers to the lack of secure access to enough safe and nutritious food for normal growth and development and an active and healthy life. The three pillars of food security are known as availability, accessibility, and utilization. While, stability is the fourth pillar, which refers to the fact that all three must be maintained on a consistent basis (FSIN, 2018). The Egyptian agricultural sector encounters numerous challenges that hinder it from achieving complete food security in several commodities, including grains, maize, red meat, and other (Abdelaal, 2019). This prompted Egypt to search for alternative sources to achieve food security, especially red meat, so camel meat is one of the options.

The camel is as special animal that, in contrast to other livestock, can produce large

quantity of meat with little expense for feeding (Kadium *et. al.*, 2006). Due to their size or feeding preferences, they depend on the residual unconsumed feed by other domestic species (Kadium *et. al.*, 2011). They are a useful source of meat in regions where the climate has a negative impact on the productivity of other animals (Kadium *et. al.*, 2006) because they are able to withstand high temperatures, intense sunlight, lack of water, sandy terrain, and inadequate vegetation (Kadium *et. al.*, 2011). Due to low production costs, camel meat is more affordable for customers than other types of livestock at a relatively low price (kadium *et. al.*, 2014). It is difficult to determine exactly the world population of camels because camels aren't typically subject to mandatory vaccinations and because pastoralists, nomadic people, and animal owners are moving frequently (Kadium *et. al.*, 2013). Table (1) shows that world camel population has steadily increased from (2003-2012) and (2013-2021) this is linked to the increase meat demand as well as in Egypt has steadily increased during the same periods.

Table 1. The global and Egyptian populations of camels in (2003 and 2012) and (2013 and 2021), Unit (1000 head).

Year	Worldwide camel population	Egypt camel population
2003 - 2012	23504 - 30469	136 - 141
2013 - 2021	31312 - 39296	152 - 239

Source: Collected from Food and Agriculture Organization of the United Nations and Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, statistics of livestock, different issues.

As a result of a large number of camels being slaughtered outside the authorized channels, camel meat production wasn't included in the statistics which make it probably underestimated (Kadium *et. al.*, 2013). Compared to beef, camel meat has lower fat and cholesterol content, while higher in protein and water holding capacity as well has higher proportion of polyunsaturated fatty acids which play an important role in lowering the risk of cardiovascular disorders. Additionally, camel meat is utilized as an anaphrodisiac and a treatment for hyperacidity, hypertension, pneumonia, and respiratory diseases (Yam *et. al.*, 2015). Camel meat can be used in many food industries since it contains a high percentage of glycogen (El-Badawi, 2018) and similar in taste and texture to beef (Yam *et. al.*, 2015).

1. Importance of the study and the research problem

According to the Global Report on Food Crises (GRFC, 2023), the war in Ukraine has had an outsized impact on global food systems. As well, there is a growing gap between annual demand and available amount of animal protein in Egypt. The daily available protein of animal origin (18.2g/cap/day) is too far from the minimum requirement of animal protein (29.3g/cap/day) which has been recommended by the FAO since 1989 for individuals in the developing countries (El-Badawi, 2018). Additionally, as the world population is steadily increasing, there is a steady increase in food demand worldwide and many countries face acute food crises (Al-Mahish *et. al.*, 2018). According to OECD/ FAO (2016) report, rising income levels and population increase are the

main drivers of the demand for meat. It is expected by 2050 that the demand of animal protein will rise to reach 109% as a result of population growth that expected to be 151 million in 2050 (Ashour and Abdel-Rahman, 2022). Thus, in order to meet the rising demand of animal protein, sustainable agricultural development strategy (Egypt 2030) aims to increase local production of red meat from 470 thousand tons in 2020 to 745 thousand tons in 2030 (Abdu and salah, 2023). Unfortunately, through the few decades, the scientists highlighted a critical issue namely climate change that represent the environmental, economical and social challenges due to its negative impacts on both agricultural and livestock sectors (Ashour and Abdel-Rahman, 2022). Therefore, to face all these challenges, attention must be paid to a very important high-quality source of protein that consider the key for maintain animal production sustainability and achieve food security, which is camel meat.

Although camel meat isn't universally consumed, it might be a potential alternative for beef especially in arid and semi-arid areas where camels are typically reared (Yam *et. al.*, 2015). According to numerous changes that have occurred, including rise in national population and visitors (as of December 2022, there were an estimated 289 thousand refugees in Egypt including 146 thousand Syrian refugees (GRFC, 2023)), consumer customs and preferences and increase in the awareness of the health benefits of camel meat, demand for camel meat is expected to increase in the future.

Despite the importance of the subject, there is a scarcity of studies focusing on demand, supply, or consumption of camel meat. Most studies

which addressed camel meat tended to concentrate on its physiological and biological aspects, genetics, meat properties, and disease infections.

2. The objective and contribution of the research paper

In order to help agricultural policy implementers make decisions about whether the consumption gap in red meat can be closed with camel meat, they must not only study the production potential but also research factors that influence consumption decisions and consumer preferences. Moreover, understanding consumption decisions and matching the demand for camel meat with production is vital so that the right marketing techniques can be put in place to increase the demand for camel meat. Therefore, the ultimate objective of the study is to identify and examine the factors that influence demand for camel meat, where the availability of camel meat is a crucial component in estimating the demand for camel meat and the barriers that reduce its consumption. Furthermore, this study will help fill the voids in previous studies by analyzing these factors and making recommendations for opportunities to expand the demand for camel meat in Egypt.

MATERIALS AND METHODS

1. Data sources

A survey design was conducted in order to collect data from camel meat consumers in Cairo. It is one of the most populated areas in Africa and the biggest population density in Egypt, with a population size of 10.143 million in 2022 (CAPMASS, 2022). The sample size was calculated as three hundred and eighty-four according to Thompson equation (Thompson, 2012). Considering more accurate results, interviews with a total of four hundred and thirty-two respondents were completed.

Respondents were selected using a complete random sampling procedure where all individuals have an equal and independent chance of being selected in the sample. Only respondents who were 18 years old or older were

allowed to participate in the survey. The objectives of the study were explained to respondents, and they were asked to complete the questionnaire, which will seek information on demographics and consumption of camel meat. Data were collected during April-June 2022 at different hours and at different types of retail stores because the respondents participating in the survey were always responsible for shopping for their households.

The questionnaire used for the survey sought three categories of information: The first category derives information on the socioeconomical characteristics of the respondents. The second category gain information about availability of camel meat. The third category reports information on factors influencing current consumption of camel meat or the willingness to consume camel meat (Appendix A).

Moreover, the study relied on secondary data that were collected through some publications issued by Central Agency for Public Mobilization and Statistic (CAPMASS), Economic Affairs Sector at the Ministry of Agriculture and Land Reclamation, Food and Agriculture Organization of the United Nations, Food Security Information Network (FSIN) and Global Network Against Food Crises, in addition to recent studies related to the subject of the research.

2. Data analysis

This section briefly describes the research methodology used to achieve the objective set. In the present study, the decision of consuming camel meat or not were estimated by means of logistic regression analysis. As the dependent variable, while the respondents consuming camel meat were set as (1), those who don't consume camel meat were set as (0). In the logistic regression model, where the dependent variable has two categories, independent variables can be discrete, continuous, and qualitative. Current consumption can be said to be a function of consumers' income, price of camel meat, consumption and price of beef, consumer taste preference, availability and demographics. Beef

was chosen as a substitute since it is the most popular type of red meat.

The logistic regression model employed in this study can be represented in the following functional form:

$$C_{cmt} = f (PI_{cmt}, A_{cmt}, P_{cmt}, P_b, C_b, Y, HH, G, A_g, E_d, MS, FC, T)$$

Where:

- C_{cmt} = Current consumption of camel meat
- PI_{cmt} = Price importance of camel meat
- A_{cmt} = Availability of camel meat
- P_{cmt} = Price of camel meat
- P_b = Price of beef
- C_b = Consumption of beef
- Y = Income
- HH = Household size
- G = Gender
- A_g = Age
- E_d = Educational level
- MS = Marital status
- FC = Fat and cholesterol
- T = Taste preference

RESULTS AND DISCUSSION

This section discussed the major findings of the study. SPSS 26 software was used to analyse

the collected data. Before the discussion of the findings, the Variance Inflation Factor (VIF) test was used to diagnosis the multi-collinearity test (Thompson *et al.*, 2017). Because the lack of multicollinearity is a crucial assumption for logistic regression (Stoltzfus, 2011; Starkweather and Moske, 2011).

1. Multi-collinearity test amongst parameters

Variance Inflation Factor (VIF) estimates how much the variance is inflated, and although there is no firm consensus on the best cut off point for VIF values (Thompson *et al.*, 2017), generally values >10 are typically regarded as indicating multicollinearity, and this is a common cut off point advocated by statisticians and used in the literature (Lee *et al.*, 2016; Ngema *et al.*, 2018; Johnston *et al.*, 2018). Furthermore, the mean tolerance was checked and met the recommended criteria of being < 0.2 (Chen *et al.*, 2018). According to Table 2 below, it was concluded that there was little correlation indicating that the model unbiased.

Table 2. Collinearity statistics

Variable	Variance Inflation Factor	Tolerance
G	1.136	0.880
A_g	1.235	0.810
E_d	1.920	0.521
MS	1.233	0.811
HH	1.653	0.605
Y	5.822	0.172
C_b	2.362	0.423
P_b	3.382	0.296
P_{cmt}	1.627	0.614
A_{cmt}	1.176	0.850
FC	1.696	0.590
T	1.876	0.533
PI_{cmt}	1.731	0.578
	Mean VIF = 2.07	Mean Tolerance = 0.59

Source: IBM SPSS Statistics Viewer

2. Frequencies results

Four hundred and thirty-two respondents participated in the survey. Demographic and socioeconomic information such as gender, age, marital status, educational level, household size and average monthly household income were obtained. Thus, the information gotten from the responses is summarized in Figure 1 through Figure 6. Furthermore, frequencies on the survey results are found below in Table 3 and Table 4.

Fifty-two percent of the survey respondents were females. The median age for the sample fell in the 45–54 age category. The sample’s median household size ranged between 3 to 4 members. The sample’s median household income fell in the 15000 – 20000 EGP category. According to survey responses, 51.4% of the respondents were married, 33.3% were single, 11.8% were divorced and 3.5% were widowed. In addition, 2.1% of the respondents were illiterate, 5.8% completed primary education, 23.8% completed

secondary education, 60.9% had obtained university education and 7.4% had received an advanced or post-graduate education. Among the four hundred and thirty-two respondents, 241 respondents indicated that they had consumed camel meat, 191 respondents hadn’t consumed it. 60.6% of the respondents were willing to try all types of camel meat products if it was easily available in area food stores, 19.9% were willing to try camel burger, 5.6% were willing to try camel shawarma, 3% were willing to try camel sausages, 4.2% were willing to try camel luncheon and 6.7% were less willing to try camel meat products. Furthermore, 44% of the respondents indicated that they would eat less beef if they consumed or increased consumption of camel meat, 0.9% would eat less lamb, 20.4% would eat less chicken, 0.2% would eat less fish and 34.5% wouldn’t decrease consumption of any substitute if they consumed or increased consumption of camel meat.

Gender

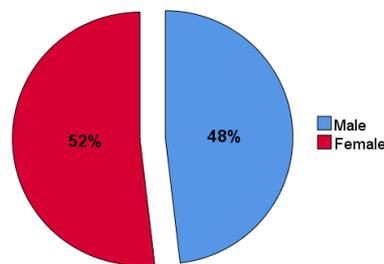


Figure 1. Gender

Age

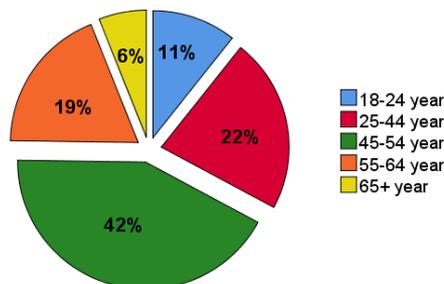


Figure 2. Age

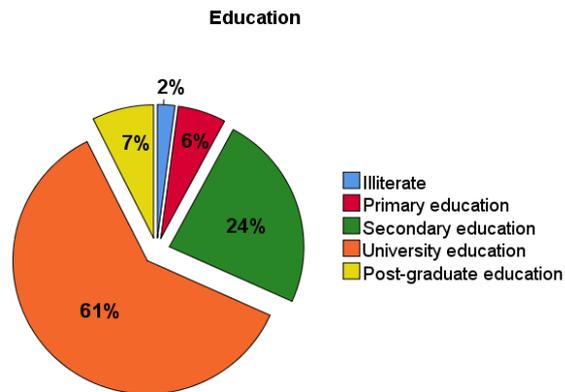


Figure 3. Educational level

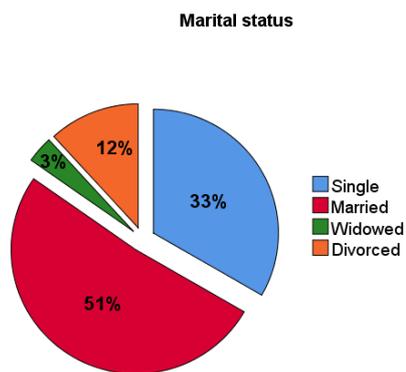


Figure 4. Marital status

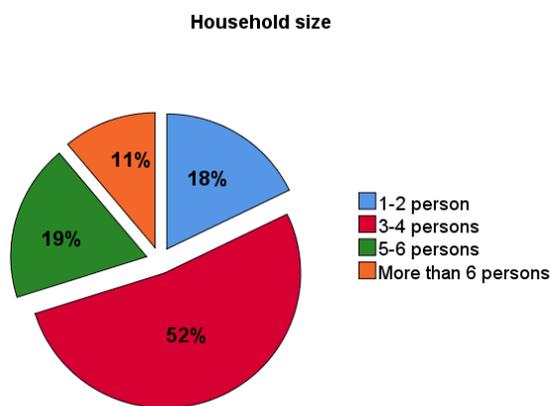


Figure 5. Household size

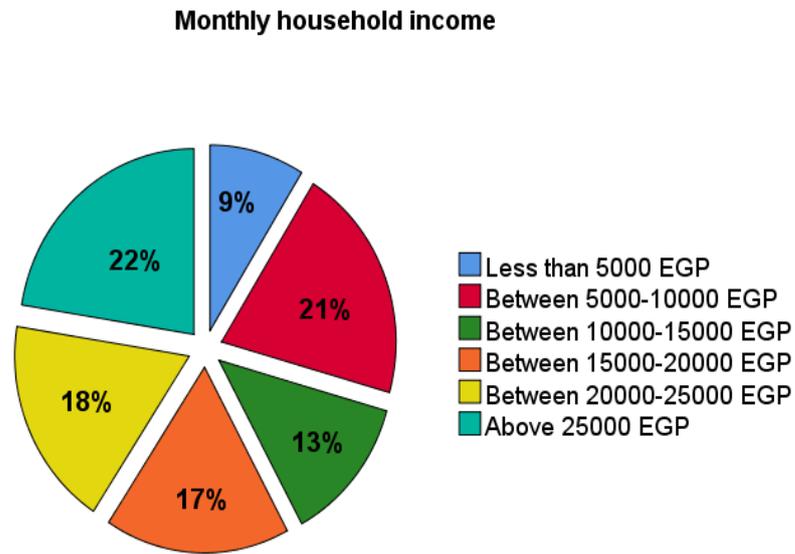


Figure 6. Monthly household income

Table 3. Frequencies on factors that influence the willingness to purchase camel meat

Availability	Number of responses	Percentage
Easily available		
No	196	45.4
Yes	211	48.8
Not sure	25	5.8
Willingness to try camel meat products		
Burger	86	19.9
Shawarma	24	5.6
Sausages	13	3.0
Luncheon	18	4.2
All the above	262	60.6
None	29	6.7

Source: IBM SPSS Statistics Viewer

Table 4. Frequencies on factors that influence the willingness to consume camel meat

Consumption: behaviour/habits	Number of responses	Percentage
Family consumption		
No	191	44.2
Yes	241	55.8
Lack of interest in consumption		
Dislike its taste	27	14.1
Didn't eat during childhood	16	8.4
Wasn't available	144	75.4
Others	4	2.0
Quantity of camel meat consumption (kg/month)		
0	204	47.2
Less than 1	55	12.7
1-2	106	24.5
2-3	58	13.4
3-4	9	2.1
Less consumption		
Beef	190	44.0
Lamb	4	.9
Chicken	88	20.4
Fish	1	.2
None	149	34.5
Quantity of beef consumed (kg/month)		
0	163	37.7
Less than 1	10	2.3
1-2	153	35.4
2-3	65	15.0
3-4	25	5.8
4-5	12	2.8
More than 5	4	.9
Consumption: price		
Price of camel meat (EGP)		
110	23	5.3
120	274	63.4
130	134	31.0
Other	1	.2
Price of beef (EGP)		
160	66	15.3
180	149	34.5
190	88	20.4
200	36	8.3
210	52	12.0
Other	41	9.5
Importance of price in purchasing camel meat		
No	126	29.2
Yes	306	70.8
Consumption: preference/taste		
Importance of taste in consuming camel meat		
No	180	41.7
Yes	252	58.3
Knowledge level		
More information on preparation		
No	320	74.1
Yes	112	25.9
Importance of fat and cholesterol in consuming camel meat		
No	158	36.6
Yes	274	63.4

Source: IBM SPSS Statistics Viewer

3. Interpreting model output

Results were considered in terms of overall model fit, as well as considering individual variable results. Various inferential tests and descriptive measures were considered when assessing model fit. The model's overall percentage is shown in Table 5 as being 87.3%, with a sensitivity of 91.7% and a specificity of 81.7%.

Table 6 proved that the overall model is statistically significant, hence $\chi^2(30) = 332.574$, $p < .05$.

It was shown in Table 7 that, depending on whether you use the Cox & Snell R Square or Nagelkerke R Square approaches, respectively, the explained variation in the dependent variable based on the model ranges from 53% to 71%.

The Hosmer and Lemeshow chi-square test only rejects this null hypothesis if $p < 0.05$

because it presumes that the model is a good fit for the data (Ngema *et al.*, 2018). As seen in Table 8, nonsignificant chi-square means that the data fit the model well.

According to the results in Table 9, individual variable results Exp (β), Exp (β) confidence intervals, and significance values were considered. It is believed that gender plays a significant role on consumer behaviour. According to gender, consumption patterns show differences. It was found out that the odds of consuming camel meat decrease 53% for women than men. In other words, women are less likely than men to consume camel meat. Gossard and York (2003) discovered among US citizens, that gender has a significant impact on meat consumption. They suggested that because the average differences in weight between men and women, thus men physiologically require more meat than women.

Table 5. Classification table.

Classification		Predicted		Correct percentage
		No	Yes	
Observed	No	156	35	81.7
	Yes	20	221	91.7
				87.3%

Source: IBM SPSS Statistics Viewer

Table 6. Omnibus tests of model coefficients.

χ^2	df	p-value
332.574	30	0.000

Source: IBM SPSS Statistics Viewer

Table 7. Model summary.

-2 loglikelihood	Cox and Snell R square	Nagelkerke R square
260.505	0.537	0.719

Source: IBM SPSS Statistics Viewer

Table 8. Hosmer and Lemeshow test.

χ^2	df	p-value
10.952	8	0.204

Source: IBM SPSS Statistics Viewer

Table 9. Variables in the equation

	B	S.E.	Wald	df	Sig.	Exp(B)
G	-0.749-	0.374	4.008	1	0.045	0.473
A _g			13.159	4	0.011	
A _g (1)	-0.226-	0.629	0.129	1	0.719	0.798
A _g (2)	-0.044-	0.599	0.005	1	0.941	0.957
A _g (3)	1.645	0.786	4.383	1	0.036	5.180
A _g (4)	-1.660-	1.027	2.611	1	0.106	0.190
E _d			7.053	4	0.133	
E _d (1)	0.738	1.170	0.397	1	0.528	2.091
E _d (2)	-1.233-	1.239	0.990	1	0.320	0.291
E _d (3)	-1.725-	1.304	1.749	1	0.186	0.178
E _d (4)	-2.068-	1.431	2.089	1	0.148	0.126
MS	-0.255-	0.191	1.781	1	0.182	0.775
HH			1.753	3	0.625	
HH (1)	0.108	0.588	0.034	1	0.854	1.114
HH (2)	0.399	0.696	0.328	1	0.567	1.490
HH (3)	-0.322-	0.761	0.179	1	0.672	0.725
Y			15.263	5	0.009	
Y (1)	1.284	0.605	4.509	1	0.034	3.612
Y (2)	0.663	0.989	0.448	1	0.503	1.940
Y (3)	-0.447-	1.065	0.177	1	0.674	0.639
Y (4)	-1.368-	1.198	1.304	1	0.254	0.255
Y (5)	-0.481-	1.345	0.128	1	0.720	0.618
C _b			16.272	6	0.012	
C _b (1)	19.007	11296.801	0.000	1	0.999	179743340.526
C _b (2)	-1.181-	0.542	4.745	1	0.029	0.307
C _b (3)	-2.227-	0.702	10.059	1	0.002	0.108
C _b (4)	-3.964-	1.303	9.248	1	0.002	0.019
C _b (5)	-4.178-	1.777	5.531	1	0.019	0.015
C _b (6)	-2.764-	2.029	1.856	1	0.173	0.063
P _b	0.044	0.023	3.662	1	0.056	1.045
P _{cmt}	-0.156-	0.041	14.795	1	0.000	0.856
A _{cmt}	1.521	0.325	21.895	1	0.000	4.578
FC	2.531	0.729	12.043	1	0.001	12.561
T	0.085	0.440	0.037	1	0.847	1.089
PI _{cmt}	2.937	0.536	30.069	1	0.000	18.861
Constant	10.504	5.752	3.334	1	0.068	36465.334

Source: IBM SPSS Statistics Viewer

Camel meat consumption could differ substantially with age. It was noticed that there is positive correlation at a significant level of 5% between age and camel meat consumption. When compared with respondents aged between 18-24, older respondents aged between 55-64 were more likely to consume camel meat than younger respondents. Akinsulu *et. al.* (2019) revealed that meat consumption increase as the age of the household head increases. Education level has been identified as a key variable in healthy diet behaviour. This variable is included in the model because families with higher levels of education are more aware of their nutritional needs. However, it was found that there was no significant difference in camel meat consumption between less or non-educated households and more educated households. Ayyıldız and Çiçek (2022) found that no significant relationship between the likelihood of consuming red meat and the level of education of the head of household. According to analysis results, it was found that there was no significant difference in camel meat consumption between married individuals and non-married individuals. Kızılaslan (2022) determined that no statistically significant relationship between the individuals' marital status and red meat consumption. The size of the household is taken into account as a factor in explaining the amount of camel meat consumption. This variable is incorporated in the model because large households tend to consume more red meat. It was indicated that there was no significant difference in camel meat consumption between smaller households and larger households. Akinsulu *et. al.* (2019) revealed that the amount of meat consumed increases along with family size.

The primary factor influencing consumer behaviour is the average monthly household income. This variable is included in the model because low-income households may consume more red meat when red meat prices are lower as the case in camel meat since it has the lowest prices compared to other red meat. It was observed that the lower income households earned between 5000-10000 EGP were more likely to consume camel meat than households

earned less than 5000 EGP and other higher income households. Davis and Lin (2005) found that consumers with low incomes tend to consume more beef than do consumers in other income households. While Uzunöz and Karakaş (2011) indicated that the consumption of red meat increases by about 8.96% for every unit increase in consumer income.

Beef is generally considered a substitute for camel meat due to its popularity. Two sets of variables accounting for the potential effects of camel meat substitutes are the consumption quantity and approximate price of beef. Results gotten indicated that the respondents who consumed more beef were least likely to consume camel meat than respondents who don't consume beef indicating a negative and significant relationship between the consumption quantity of beef and the current consumption of camel meat. Results also showed that there is a positive and significant relationship between the current consumption of camel meat and the price of beef. For every unit increase in beef price, the odd ratio of consuming camel meat increase by 4.5%.

The study has estimated the price-consumption relationship of camel meat by using the price of camel meat and the price related factor represented in the importance of camel meat price. From the regression results, findings indicated that there is a negative and significant relationship between the price of camel meat and the current consumption of camel meat. For every unit increase in camel meat price, the odd ratio of consuming camel meat decreases by 14.4%. Kurtu (2004) stated that the price is one of the factors influence camel meat production, trading and consumption. In addition to Abdelradi *et. al.* (2021) showed that the increase in price of fresh red meat lead to a decrease in the consumption amount. Results also showed that the odds of consuming camel meat are 19 times higher for respondents who consider price playing an important role in their consumption decision than those who consider price unimportant in their decision to consume.

The availability of camel meat is a crucial component in estimating the demand of camel meat. According to results, the odds of consuming camel meat are 4.5 times higher for respondents who had easy access to camel meat than those who hadn't easy access or those who were unsure whether it was easily available around them or not. Taste is important factor influencing consumption decision. This variable is included in the model to understand consumers behaviour and perception about camel meat. It was observed from the model results that there is positive and non-significant relationship between taste of camel meat and camel meat consumption among households.

According to studies, camel meat is rich in proteins, iron, and lower in fat and cholesterol content. Therefore, results gotten from the regression indicates that the odds of consuming camel meat are 12.5 times higher for respondents who have prior knowledge to the fat and cholesterol contents of camel meat than those who haven't prior knowledge. Health-conscious consumers are another source of demand for camel meat. Due to its nutritional benefits, consumers consume camel meat. Camel meat provides superior nutritional attributes to other red meat since it is a naturally leaner red meat substitute. Consumers believe that fat and cholesterol content play a significant role in determining their consumption decision.

4. Barriers reduce camel meat consumption

Respondents' reasons for not consuming camel meat include the lack of availability of camel meat (75.4%), lack of appeal of camel meat taste (14.1%), not having the habit of consuming it during childhood because their families didn't consume camel meat (8.4%) and other reasons (2%). According to what mentioned by several studies (Abdeldaiem and Ali, 2014; Abd El-Halim, 2014; Shalaby *et al.*, 2018), people don't consume camel meat because of its toughness taste.

CONCLUSION

Globally, the war in Ukraine has had an outsized impact on food systems in all countries, according to the Global Report on Food Crises (GRFC, 2023). In the same context, Egypt is no exception, there is a growing gap between public annual demands and available amounts of animal protein in Egypt. Moreover, by 2050 it is expected that the demand of animal protein will rise to reach 109% as a result of population growth that expected to be 151 million in 2050. Furthermore, the problem of climate change that represent the environmental, economical and social challenges due to its negative impacts on both agricultural and livestock sectors. Therefore, the paper aims to identify and analyze the factors that influence demand for camel meat and the barriers that reduce its consumption in order to assist Egyptian policymakers decide whether the consumption gap in red meat can be closed with camel meat. To achieve this objective, a logistic regression analysis is carried out considering key factors to be tested influencing the decision to consume camel meat. The findings indicate that there is a statistically significant relationship between camel meat consumption and gender, age, monthly household income, consumption and price of beef, camel meat price, fat and cholesterol contents and easy access to camel meat.

Additionally, existing research results has identified lack of availability as one of the major factors obstructing camel meat consumption. Therefore, the study recommends that government can develop proper marketing system/channels for distributing and selling of camel meat through for example the Ministry of Agriculture outlets, the Ministry of Interior outlets, armed forces outlets and consumer associations to encourage consumers to have easy access of camel meat as well as adoption of advertisement campaigns such as in-store demonstrations, camel meat recipes, and mass media advertisements to increase the awareness of the health benefits of camel meat because still part of the population unaware of these health benefits.

Furthermore, findings showed that one of the most prevalent reasons for not consuming camel meat, the perception among a certain number of consumers that camel meat is tough. However, it has been claimed that the taste and texture of the camel meat is similar to that of beef. Thus, it is believed that slaughtering male camels when they are 1-3 or even 4-5 years old is the optimum age for meat production (El-Badawi, 2018). As well the study suggests that companies should implement innovative processing and preservation technologies for development of diverse camel meat products with superior consumer acceptance.

According to results, most of the respondents prefer various types of camel meat products which create a high consumption opportunity of camel meat to increase its demand through expanding the utilization of camel meat instead of beef in food industries since camel meat is similar in taste and texture to beef and contains a high percentage of glycogen. It may also have an edge for consumers as well as meat products producers over beef due to its lower price.

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Appendix A

Questionnaire form

This questionnaire is a component of a doctoral thesis. Its purpose is to assess the consumption of camel meat in Cairo. You have been randomly selected to participate. Your answers will be kept completely confidential. Participation is optional, and you may withdraw at any time. Thank you for your time.

- Q1. What district do you live in?
- Q2. What is your gender?
- Male Female
- Q3. How old are you?
- 18-24 25-44
 45-54 55-64
 65+
- Q4. What is your educational level?
- Illiterate Primary education
 Secondary education University education
 Post-graduate education
- Q5. What is your current marital status?
- Single Married
 Widowed Divorced
- Q6. How many people are in your household?
- 1-2 3-4
 5-6 More than 6
- Q7. Average monthly household income in EGP
- Less than 5000 Between 5000-10000
 Between 10000-15000 Between 15000-20000
 Between 20000-25000 Above 25000
- Q8. Have you or your immediate family consume camel meat?
- Yes No
- Q9. Is camel meat easily available in your area?
- Yes No
 Not sure
- Q10. Which camel meat product do you think you would try if it was available in your area food stores or grocery stores?
- Burger Shawarma
 Sausages Luncheon
 All the above None

Q11. How much does a kilo of camel meat cost?

- 110 LE
- 120 LE
- 130 LE
- Other (specify) _____

Q12. Which meat would you decrease your consumption from it if you consumed or increased your consumption of camel meat?

- Beef
- Lamb
- Chicken
- Fish
- None of the above

Q13. How much does a kilo of beef cost?

- 160 LE
- 180 LE
- 200 LE
- Other (specify) _____

Q14. Is price important in your decision to purchase camel meat?

- Yes
- No

Q15. How much camel meat do you monthly consume per kilogram?

- None
- Less than one
- 1-2
- 3-4
- 4-5
- More than 5

Q16. How much beef do you monthly consume per kilogram?

- None
- Less than one
- 1-2
- 3-4
- 4-5
- More than 5

Q17. What is the reason if you don't consume camel meat?

- I don't like its taste
- I didn't eat during childhood
- It wasn't available
- Others

Q18. Is taste important in your decision to consume camel meat?

- Yes
- No

Q19. Is fat and cholesterol content important in your decision to consume camel meat?

- Yes
- No

Q20. If you had more information on how to prepare camel meat, would you increase your consumption from it?

- Yes
- No

المساهمة المحتملة لإنتاج لحم الإبل في تحقيق الأمن الغذائي من البروتين الحيواني في مصر

هبة محمد صلاح ، خالد احمد عبده ، يحيى حامد الاسرج

قسم الأقتصاد الزراعي- كلية الزراعة – جامعة القاهرة - مصر

الملخص العربي

هناك فجوة متزايدة بين الطلب على البروتين الحيواني في مصر والكميات المتاحة منه. لذلك، تهدف هذه الدراسة إلى تحديد وتحليل العوامل التي تؤثر على الطلب على لحوم الإبل والاسباب التي تقلل من استهلاكها من أجل توجيه صانعي القرار في تحديد ما إذا كان من الممكن تقليل الفجوة الاستهلاكية من اللحوم الحمراء بلحوم الإبل. تم تحقيق هذا الهدف من خلال استخدام تحليل الانحدار اللوجستي بناء على بيانات المسح الميداني لمحافظة القاهرة (٤٣٢ مشاهدة). تشير النتائج إلى وجود علاقة ذات دلالة إحصائية بين الجنس، العمر، متوسط الدخل الشهري، استهلاك وسعر اللحوم البقري، سعر لحوم الإبل، محتوى الدهون والكوليسترول وسهولة توفر لحوم الإبل وبين استهلاك لحوم الإبل. اوصت الدراسة بضرورة قيام الحكومة بتطوير قنوات تسويقية مناسبة لتوزيع وبيع لحوم الإبل من خلال منافذ وزارة الزراعة، منافذ وزارة الداخلية، منافذ القوات المسلحة، والجمعيات الاستهلاكية.

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The potential contribution of camel meat production to achieve food security from animal protein in Egypt