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Bovine meat trend in Egypt: factors affecting domestic prices.

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Abstract : Bovine meat is an important economic and dietary value in Egypt. This study examined the trend of bovine meat production, consumption and imports during the period 2000- 2014. It also examined the main factors driving meat prices up at local markets over the same period. The results showed that average meat consumption (598.5± 20.3) in 1000 MT was greater than average meat production (384.5± 18.4) in 1000 MT over the entire study period (T= 2.83, df= 7, P < 0.05). Despite a peak in year 2005 meat production attained a negative annual percentage of change by 3.5% during the study period. Consumption and production exhibited a positive correlation coefficient of 0.69 at P < 0.05, which indicated a similar pattern of cyclic changes. Despite a peak in year 2005 meat consumption attained a negative annual percentage of change by 1.5% during the study period. On the other hand, meat imports kept a pattern of steady increase with an annual percentage of change by 2.3% to offset the meat gap, which was estimated to be 211, 000 MT . Meat prices kept rising throughout the study period where the results showed that with one year increase the meat price index increased by 9.03%. We used a level-level multiple regression model to predict the factors affecting meat prices at local market. The results indicated that meat production, exchange rate of US$ for Egyptian pound and per capita income were the most important driving factors of meat prices. The latter two factors were the highly significant drivers in the model. The study recommends the government to institute new policies to determine the optimal slaughter weight of bovines, provide training for cattle feedlot holders on the most effective cost/benefit ways of formulating fattening rations using locally available crop by products and help them to improve the genetics of their feeder cattle to achieve a high carcass quality. The relevant authorities also should try to establish a value based system that measures the quality of fed cattle carcasses and then establish individual sale prices based upon these measures.
Key words : regression, bovine meat, genetics, feedlot, crop by products.

Introduction:

The reason for the production of livestock products is that they are in demand and consumers are willing to pay for them. However, the high feed prices are impacting the livestock industry, especially in Egypt, which import most of the animal feed ingredients at high cost.

Small –scaled animal holders mainly maintain the livestock industry in Egypt where production of dairy products come first and meat products are of secondary importance. Many factors affect meat production

including the accelerating rate of inflation, feed costs, diseases and severe climatic conditions[1]. Egypt, in fact, remains dependent on imported feed ingredients (grains, milling byproducts, added vitamins, minerals, fat oils, etc.,) as important portion of animal feed. It is estimated that about 60% of the primary animal feed ingredients mainly soya beans and corn are imported to be used locally in the formulation of fattening livestock's feed. Bovine meat constitutes more than 60% of the red meat in the local market, which is considered an important source of protein. Egyptians prefer bovine meat over other sources of animal meat, however rising bovine meat prices and decreasing production make consumers boycott bovine meat and look for other protein sources.

Research problem and objectives

There is a continuous annual increase of food demand by Egyptians, due mainly to the increasing population growth and per capita income. Bovine meat, an important portion of edible red meat in the local market, provides a very important source of animal protein and is highly preferred by Egyptians over other meat sources. In 2007 and early 2008 prices of major crops had started to rise almost tripling by mid 2008, which had influenced the prices of meat of fattening livestock dependent on these crops for their feeding[2]. The livestock industry in Egypt, on the other hand had been exposed to a highly infectious disease in 2006 and 2008, which caused a high mortality rate in cattle and buffalo herds with a considerable drop in bovine production.

The objective of this study is to provide both descriptive and quantitative analysis of bovine meat production, consumption and imports over the period from 2000 to 2014. In addition, the study attempts to statistically analyze the relationship between meat prices and other possible driving factors that predict the rising prices of bovine meat at local market.

Methodology:

1- Data sources:

We obtained a series of data on bovine meat prices, production, consumption, imports, fuel costs, animal feed prices and rate of inflation from different sources[3,4,5]. The data in this study are annual and cover the period from 2000 to 2014.

2- Statistical analysis:

We analyzed the data for production, consumption and imports trend by fitting a general time series model and a level – level regression equation to time series data for the period 2000-2014. To predict the driving factors affecting meat prices we regressed meat price index against other predictors using a level-level multiple regression and step wise regression for the best fit outcome. We processed the data using Minitab 13 statistical package, Minitab inc., State College, Pennsylvania, USA.

Results:

1- Time trend of meat production, consumption and imports

Table (1) presents summary statistics of the selected variables, production, consumption and imports. The average amount of meat production (384, 000 MT± 18.4) was significantly lesser than the average amount of consumption (598, 000 MT± 20.3, T= 8.6, DF= 28, P <0.05) over the entire period (Fig1). Meat production exhibited annual pattern of change where the highest amount of production amounting (500,000 MT) was achieved in 2005 and the lowest amount of production amounting (280,000 MT) was achieved in 2012. Production showed a positive percentage of change by 18.7% in year, 2005 but a drop in percentage change by 43% was recorded in year, 2014 compared to year, 2005. The average meat production between these periods were compared and results showed that in the period from 2010 to 2014 the average production estimated to be (306,000 MT± 12) was significantly lesser than that of previous years (T= 2.83, DF= 7, P< 0.05). In general, meat production attained a negative annual percentage of change by 3.5% over the entire study period.

Table (1): Average amount of meat production, consumption and imports from 2000 to 2014.

Parameter	Average± (se)	Measuring unit (metric ton)
Production	384.2 ±(18.4)	1000 MT
Consumption	598.5 ±(20.3)	1000 MT
Imports	213 ±(13.5)	1000 MT

(se): standard error of the mean.
Source: USDA statistics, metric ton (MT).

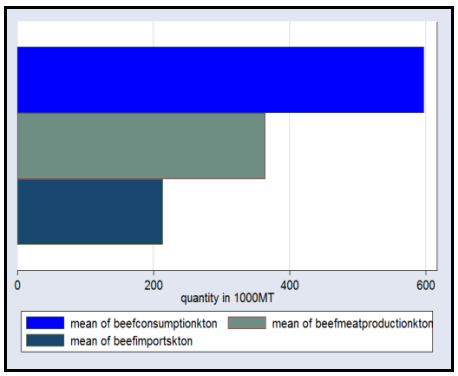

Fig (1): Average amount of meat production, consumption and imports over the study period.

Meat consumption followed a cyclical pattern of change during the same period. There was a positive correlation between annual changes of the amount of meat consumption and meat production($r = 0.69$, $P < 0.05$) during that period. Consumption percentage change showed a positive trend by 12.8% in year 2006 but a negative trend in consumption occurred by 23.4 % in year 2014. **The** average amount of consumption between these periods were compared and results showed that in the period from 2010 to 2014 the average consumption estimated to be (540,000 MT± 12) was significantly smaller than that of previous years ($T = 2.90$, $DF = 9$, $P < 0.05$). In general consumption attained a negative annual percentage of change by 1.5% over the entire study period. The imbalance between production and consumption created a meat gap, which was estimated to be (211,000 MT) .There was a positive annual percentage of change for meat gap represented by 1.8% (Fig 2).

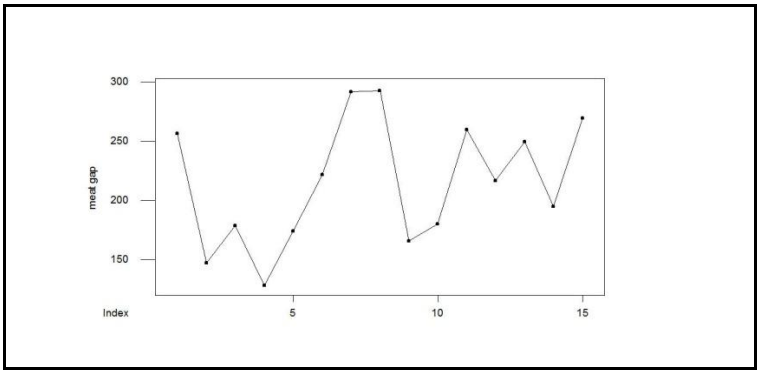

Fig (2): Meat gap trend over the study period.

Meat imports achieved a positive annual percentage of change by 2.2% over the entire study period but the highest percentage of change occurred in year, 2006 and year, 2007 by 28%. There was no significant correlation between production or consumption and imports. With regard to self sufficiency in bovine meat the results showed that the trend followed an increasing pattern from 47% to 72% through the period from 2000 to 2004 and declined from 69.4% to 55.4% from 2005 to 2014 (Fig. 3).

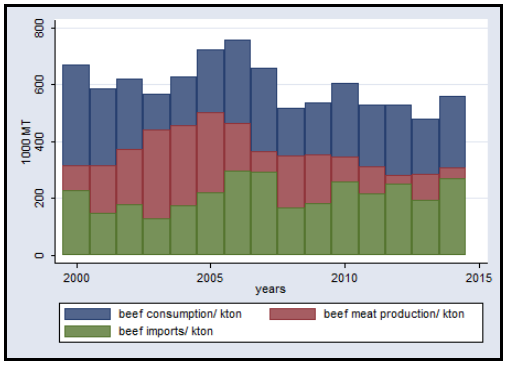

Fig (3): The general trend of meat production, consumption and imports over the study period.

Table (2) presents the level- level simple regression of meat production, consumption and imports as dependent variables regressed against years as an independent variable. The findings show that 70.9% of changes in meat production was attributed to the time variable and 26.1% of changes in meat consumption was also attributed to the time variable (both equations were significant). On the contrary, there was no significant relationship between the trend of meat imports and time variable.

$\hat{y} = b_o + b_1 X_1$ where $\hat{Y}$ represents production, consumption and imports in each equation and X_1 represent time variable.

Table (2): General time trend estimates of meat production, consumption and imports from 2000 to 2014.

Parameter	**Equation**	**P value**	**R^2**	**% Annual change**
Production	$\hat{Y}_i = 27285 - 13.4 X_i$ T=(-5.63)***	< 0.001	70.9%	-3.5%
Consumption	$\hat{Y}_i = 18891 - 9.1 X_i$ T=(-2.19)*	< 0.05	26.1%	-1.5%
Imports	$\hat{Y}_i = 18891 + 4.82 X_i$ T=(1.7)	Non significant	17.3%	2.2 %

( )* significant at < 0.05, ( )*** significant at < 0.001

The findings show that time was not a significant predictor for meat imports compared to its relationship with production (highly significant) and consumption (significant).

Factors affecting meat prices in the local market.

We assigned meat price index as a response and used a simple regression to predict its outcome over the entire study period (Table 3).

Table (3): Time trend equation for the evolution of meat prices over the entire study period.

Equation	**R^2**	**F**	**P value**
$\hat{Y}_i = -18010 + 9.03 X_i$ T= (-29.03)***	98.5%	(852.54)***	< 0.001

( )*** significant at <0.001

We adopted a level-level multiple regression to analyze the relationship between meat price index ($\hat{Y}$) and other predictors, including exchange rate of US$ for Egyptian pound (X_1), meat production in 1000 MT (

X_2), per capita income in pound (X_3), price index of corn (X_4) and price index for soya bean (X_5). The price indices for both corn and soya beans were deleted by the model, due mainly to a multicollinarity behavior with other predictors. Table (3) shows the output values of the regression and the high value of R^2 indicates how well the model fits the data. The findings indicate that 94.0% of the changes in Yˆ are related to X_1, X_2 and X_3. The relationship between Yˆ and X_1 and X_3 was positive whereas it was negative with X_2 (Fig 4). A 1% increase in exchange rate of US$ for Egyptian pound and a 1% increase in per capita income would increase the meat price index by 16.1% and 0.0303%, respectively. On the other hand, a 1% increase in meat production would reduce the meat price index by 0.126%.

Table (3). Output values of the regression of meat price index (Yˆ) and other predictors.

Equation	**R^2**	**F**	**P value**
Yˆ= - 114.6+16.1 X_1- 0.126 X_2+0.0303 X_3 T=(4.67)*** T=(-2.14)* T=(4.50)***	94.0%	(57.83)***	< 0.001

( )*** significant at <0.001,

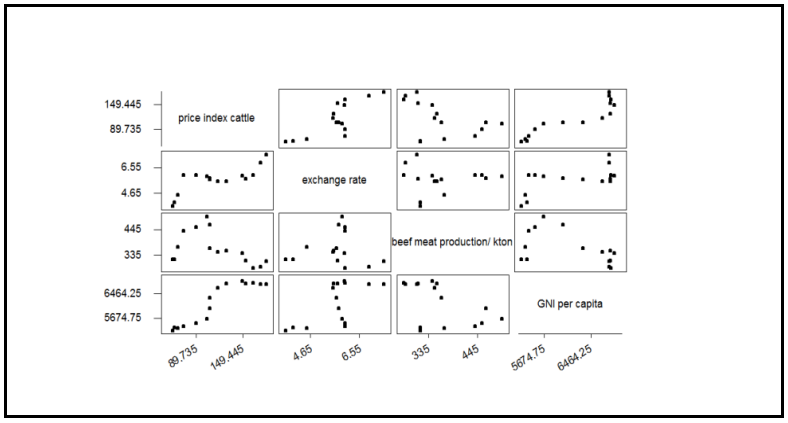

Fig (4): Scatter plot showing the relationship between meat price index and other significant predictors.

Discussion

Agriculture policy in Egypt has gone through significant reforms since early 1990s with a strong believe that transformation in the agriculture sector is a key for economic growth[6]. Due to the expansion of livestock industry to meet the growing demand for animal protein, which was accelerated at the beginning of 2000, feedstuff supplies faced a severe strain. Supplies of feedstuff for livestock are traditionally based on the country's grain and cotton crops, however corn and soya beans, a main constituent of feedlot rations are in short supply[7]. It was indicated that concentrated feed, a very important high energy feed for fattening, is locally in short supply[8]. Egypt had to import maize and soya beans to offset the deficit in local supply. However, Stocks of concentrate feed ingredients are falling with reduced imports, reduced demand and the increased cost of holding stocks of concentrate due, mainly to the declining value of the Egyptian pound[9]. With the present trend of rising feedstuff prices and global inflation, livestock production is increasingly constrained by feed scarcity and the high cost of feeds[10]. The trend in bovine meat production, despite the positive percentage change in year, 2005 by 18.7% compared with year, 2000, attained a negative percentage of change by 3.5% over the period of study. The drop in meat production is, in fact related to the availability of the feed stuffs, with particular emphasis on concentrates[10] and to the decrease in total animal slaughter from 1.5 million head to 1.4 million head[11]. In 2006 and 2008 the Egyptian population of bovines had been infected with a highly infectious virus of foot and mouth disease, which resulted in high mortality rate in bovine herds. The effect of the disease was combined with the rising in feed costs[12]. The highly significant drop observed in meat production in 2010 and 2012 was a consequence of the bovine high mortality rate caused by the infection combined with the negative effect of high feed prices in 2007/2008[8]. Beef production is believed to be down from the 2011 level,

due to the lingering effect of FMD-SAT2 outbreak. The drop in total meat consumption in 2010-2012 could be a consequence of economic stagnation brought about political instability as well as low meat production. Egypt has undergone a dramatic political instability over the last three years from 2011, which has forced the economy to slow down[6]. In general beef consumption is driven by the availability of beef meat in reasonable prices for the majority of poor people[11]. It was mentioned that the average per capita consumption of red mead is estimated to be 8.5 Kg/ year, which is quite low compared to consumption levels in other countries[7]. Despite these facts a meat gap still exists which was estimated in this study by 211, 000 MT. Egypt had to bridge this gap between low domestic beef production and demand through meat imports. Imports in this analysis attained a positive annual percentage of change by 2.3% over the study period. Meat prices had a significant relationship with meat production, per capita income and depreciation of the Egyptian pound against the US$. Imports of feed concentrates depend on the availability of foreign currency, especially the US dollar. Due to the declining value of the Egyptian pound over the last ten years costs of feed ingredients have risen to a high level. The percentage annual change of imported maize and soya beans has been calculated by[10] as 3.5% and 0.02%, respectively which reflected a significant deficiency in fattening bovine requirements. It was stated that the increase in world feed prices coupled with the low value of the Egyptian pound against the US$ have led to the increase of meat prices[11]. Despite the efforts done by the ministry of supply and internal trade to bound the feed prices at LE 1200-1300 /ton prices increased to LE 1700/ton and reached LE 2100/ton in 2014.

There should be new animal feeding strategy to alleviate the high costs of imported feed ingredients to help reduce the rising meat prices in Egypt. It was recommended to expand agricultural of cultivating maize and soya beans and use of crop residues in animal nutrition[10]. Crop residues are readily available but mostly of low nutritive values, however mixing these residues with small amount of naturally occurring high protein supplement such as soya beans, cotton seed cakes and sunflowers increase digestibility[12] for feeding and the increase of the local maize production could reduce costs of import[13].

In conclusion we can say that the government should institute new policies to determine the optimal slaughter weight of bovines to increase meat productivity. It should also provide training for cattle feedlot holders on the most effective cost/benefit formulation of fattening rations using locally available agriculture by products and help them improve the genetics of feeder cattle to achieve a high carcass quality. The relevant authorities should work to establish a value based system that measure the quality of fed cattle carcasses and then establish individual sale prices based upon these measures.

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