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Research Article

FORECASTING OF CATTLE MEAT PRODUCTION IN FARMS OF SAMARKAND REGION

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R.X.Qalandarov
Doctoral Student At Samarkand Agricultural Innovation And Research Institute, Uzbekistan

ABSTRACT

Ensuring food security of the population is considered important. The population is focused on the development of strategies for ensuring food security in the future by analyzing forecast indicators. As we know, most of the agricultural products are contributed by farmers. In this article, the indicators of beef production in farmers' farms of Samarkand region are forecasted using the ARIMA model.

KEYWORDS

Higher education, digital technologies, nano, artificial intelligence, digitalization, educational technologies, digital pedagogy, hemis, human capital.

INTRODUCTION

Relevance of the topic.

Today, it is an urgent issue to ensure food safety based on the research and effective implementation of new innovative possibilities of increasing the production of agricultural products in accordance with the medical standard per capita. Food security is a growing problem around the world. It is known that the demand for meat products from food products is high. Meat is an irreplaceable animal protein, which is important for the growth of the human body. Meat production also remains a problem in many developing countries.

Demand for food, namely meat and meat products, is increasing due to the increase in the number of people in Uzbekistan and the increase in the number of tourists. Of the meat and meat products, beef is of

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particular importance. The demand for beef is increasing day by day, it has less cholesterol than pork and beef, and it contains all the essential amino acids, fatty acids, and minerals. LS Kalangi et al in their study of Indonesia concluded that "...if the gap between beef production and consumption cannot be minimized, Indonesia will remain permanently dependent on imports." Due to the insufficient production of meat in our republic, as a result of the constant increase in consumer prices, we are forced to import breeding materials (livestock seeds), live animals or meat. Due to some reasons of economic fluctuations, the price of meat products increases. The rise in prices has also created a number of problems in the supply chain of the agricultural sector, which threatens food security around the world. Therefore, especially in 2022, the import of meat and meat products increased significantly. In January-October 2022, the import of meat and meat products amounted to 252.2 million US dollars, which increased by 91.7% compared to the corresponding period of 2021.

The decision of the President of the Republic of Uzbekistan No. PQ-120 of February 8, 2022 on the development of the livestock sector "On approval of the program for the development of the livestock sector and its sectors in the Republic of Uzbekistan for 2022-2026" was adopted. Based on the target parameters and main directions for the relevant period, the program is to be implemented step by step through the "Road Map" approved by the Cabinet of Ministers every year.

In 2022, Samarkand region is leading in the production of meat products in our republic with 11.5 percent. If we analyze the meat products in Samarkand region in terms of farms, 14.6 percent of farms, 80.9 percent of farmers' farms, and 4.3 percent of agricultural organizations produce meat products. The data of our analysis above shows that it is important to forecast the meat products grown in farms of Samarkand region.

MATERIALS AND METHODS

We can see the importance of meat products grown in livestock farming in peasant farms in meeting the demand of the country's population for meat and meat products. At this point, it is important to determine the prospects of meat production on farms and analyze the factors that directly affect it.

In this regard, one of the most effective models for determining future forecasts is the ARIMA (Averaging Integrated Autoregression Model) model. This model is determined by three integer structural parameters p, d, q, the order of p-series autoregression, the order of the difference needed to be calculated to make the d-series stationary, q-residual autoregression is calculated, and it is the order of the moving average value model.

The ARIMA model describes the modeling of empirical relationships between times based on an observed value that can be used to predict future values. The

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model is one of the most common and effective approaches to time series forecasting and aims to describe autocorrelations in the data. Modeling is essentially a data-oriented research method, and in approximately modeling the stochastic nature of time series using the autocorrelation function, the future forecast values of time series are determined by identifying information such as trends, random changes, periodic components, cyclical or serial correlation.

The future value of a variable in the ARIMA(p,d,q) model is a linear combination of past values and errors, expressed as:

$$Y_t = \varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + \ldots + \varphi_p Y_{t-p} + \nu_t - \theta_1 \nu_{t-1} - \ldots - \theta_q \nu_{t-q}$$

Here:

ν_t –white noise;

Y_t – d - stationary line, $d \geq 0$

φ – autoregression parameter;

θ– the moving average value parameter.

The ARIMA model is defined as ARIMA(p, d, q) with three integer structural parameters p, d, q

In this:

p - order of autoregression;

d - the order of differentiation, which is necessary to calculate to make the series stationary;

q is the autoregression of the residual.

The ARIMA model should be implemented in the following sequence of data collected in time dynamics:

- Identifying unusual observations in the forecast by collecting data from the past period;
- Data transformation using Box-Cox transformation to stabilize variance in the analysis;
- Bringing the data to a stationary state;
- Selection of models for analysis by methods of determining autocorrelation functions;
- According to the analysis results, choosing the best model using AIC and BIC tests;
- Making a graph of the autocorrelation function of the residuals and checking the residuals;
- When the variance in the analysis results is not large, then apply the modified model for analysis.

In carrying out such an intertemporal regression analysis, the values of the variables must be stationary, or if they are not stationary, then it is required to make them stationary. When the values of the variables are stationary, their values are clearly expressed in the perspective. In this regard, the Augmented Dickey–Fuller test was used to check the stationarity of the variables. The extended Dickey Fuller test is one of the statistical tests used to check whether a series of variables representing the activity of socio-economic sectors and industries is stationary or not. This test is most commonly used in stationary analysis.

The results obtained. Beef production on farms depends on the population, the number of farms, the price of meat, the number of livestock kept on the

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farms, and the amount of meat. According to the results of the extended Dickey-Fuller test, the above variables are stationary at the 1 percent (*** p<0.01) and 5 percent (** p<0.05) levels (Table 1).

Table 1.

The result of the Extended Dickey-Fuller test of factors affecting meat production in Samarkand region farms

Variables	Test statistic	1% critical value	5% critical value	10% critical value	Test type
Population***	-1,834	-4,380	-3,600	-3,240	Drift regression
Number of farms**	-1,291	-3,217	-2,157	-1,542	Drift regression
Average income per capita***	-2,136	-3,598	-1,935	-1,355	Drift regression
Beef farming***	-2,306	-4,150	-3,944	-2,143	Drift regression
Sheep and goat meat production**	-3,164	-2,381	-1,564	-1,139	Drift regression
Poultry Farming***	-2,872	-2,107	-1,560	-1,255	Drift regression
Beef Price**	-3,481	-3,180	-2,560	-2,140	Trend regression

*** p<0.1, ** p<0.05, *** p<0.01 those in parentheses are standard errors**

The order of the series autoregression suitable for the analysis of variables affecting or related to meat production on farms, the order of the difference required to calculate the series stationarity and the determination of the residual autoregressions, based on the data in Table 1, based on the data in Table 1, STATA-17 (Statistical Software for Data Analysis) software calculated by

Table 2

The population of Samarkand region and the status of meat production in farms

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Years	Number of population	Number of farms, in units	Average income per capita, in thousands of soums	Beef, per thousand/kg	Lamb meat, in thousand/kg	Poultry, in thousand/ kg	Beef price, in soums
2010	3270831	524 236	2 029,00	144409	21069	3164	8767
2011	3326212	529945	2 619,60	149107	23069	4012	12163
2012	3380932	536034	3 029,90	154285	25833	6168	14577
2013	3445642	542806	3 654,60	160952	26953	6435	15668
2014	3514747	550744	4 207,30	167544	30595	7695	21128
2015	3583944	558687	4 631,00	176048	33316	9536	22879
2016	3651670	570333	5 603,40	184934	36281	9612	22465
2017	3720019	590401	6 594,10	182137	36566	9550	26928
2018	3798917	600570	8 087,70	173888	36232	12491	35838
2019	3877355	612346	9 447,90	190541	34743	12216	43121
2020	3947722	623448	10529,10	197109	35926	13593	53005
2021	4031324	624478	12874,40	199206	37804	14304	64520
2022	4118229	626102	15149,2	200122	36905	14662	75850

The results of the AIC (Akaike information criterion) test and the BIC (Bayesian information criterion) test, as well as the statistical significance levels of the residuals of autoregression and floating average values were compared between the models. From the studied ARIMA models in Table 2, the model that can show the most reliable values in predicting future values (ARIMA 212, the most reliable value in forecasting, for forecasting the production of cattle on farms) was selected.

Three structural parameters (p, d, q) of these selected variables are the basis for predicting their future values. Based on the prospective values of the structural parameters (p, d, q), the forecast values of beef production in Samarkand region farms for 2023-2028 were developed.

The increase in the population's income is related to their employment in agriculture and non-agricultural activities, and to a certain extent, it is related to the raising of livestock by the population in the villages, the increase in the volume of livestock products in the activity (Pic. 1).

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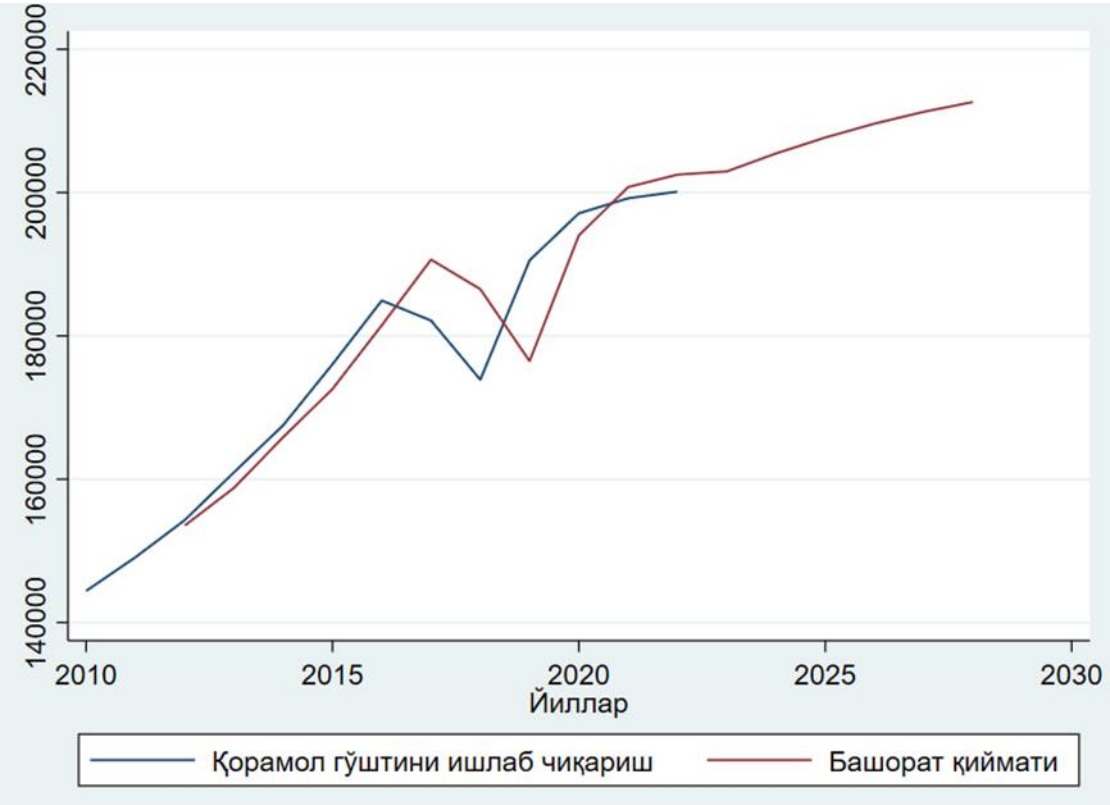

Picture 1. Самарқанд вилояти деҳқон хўжаликларида қорамол гўшти етиштиришнинг истиқбол прогноз кўрсаткичи

Feeding of cattle by the villagers, which affects the socio-economic well-being of families. In particular, according to the results of the analysis, there was a sharp decrease in the production of beef in peasant farms during the pandemic. Although the pandemic period has affected beef production on farms, the forecast value shows that the volume of beef production on farms will increase from 2023 to 2028. In particular, in 2022, 200,122 tons of beef were grown in farms, and in 2028, the forecast value shows an increase of 212,644.1 tons or 106.3%.

CONCLUSION

In Samarkand region, cattle meat production is of particular importance in increasing the income of the population and ensuring the food security of the population in the peasant farms. In our republic, the increase in the income of the population causes an increase in the demand for food, that is, for beef. The role of farms in meeting this demand is high. In Samarkand region, it is predicted that the production of beef in farmers' farms will increase by 106.3% in 2028 compared to 2022. This information can be useful in developing long-term agricultural production strategies.

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