Economic analysis the determinants of livestock production value in Iraq for the period (1990-2023)

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Abstract:

The research seeks to examine the primary factors influencing the economic worth of animal product output in the nation of Iraq by studying the impact of a number of determinants represented in feed production, the number of agricultural workers, government support, agricultural loans, the value of foreign direct investment, machinery, equipment, medicines and veterinary vaccines as independent factors and their impact on the worth of animal product output during the period 1990-2023 Based on the hypothesis that the aforementioned factors have varying effects on the worth of animal product output in the nation of Iraq. the research relied on the economic theory approach and previous studies that addressed this topic, which revealed a significant and positive impact of feed, government support, agricultural loans, and vaccines, as loan values had an impact that exceeded the impact of other variables, The negative moral impact of both the values of foreign direct investment and machinery and equipment was evident, while the impact of agricultural workers was not evident. In this research, Several findings were drawn, the most significant of which was that Iraq has experienced anomalous economic conditions, political and security conditions since 2003, which caused the livestock sector to be disrupted, Since 2017, the number of domestic livestock and poultry has seen a significant increase due to the improved economic and security situation. We therefore recommend expanding access to agricultural loans with favorable terms for livestock farmers, Since this will be of paramount importance in increasing the value of this sector and ensuring the availability of high-quality veterinary medicines and vaccines from reputable sources, which are essential for protecting livestock from diseases, epidemics, and infectious and contagious illnesses.

Keywords: Feed production, government subsidies , foreign direct investment, ARDL

Introduction:

Animal product output in the nation of Iraq is one of the main pillars of the agricultural sector, as it provides a variety of products such as meat, eggs, milk, and other products that contribute to enhancing national food security. This study examines the trends in the livestock sector in Iraq during the period from 1990 to 2023[11], It is evident that the production in this sector was not stable, but rather fluctuated significantly, reflecting the economic, political, and environmental conditions prevailing in the country. The worth of animal product output reached its lowest point at $131.08 million in 1994 **[8]**, due to the unstable events and circumstances the country was experiencing. However, with the

relative improvement in the country's situation, the worth of animal product output increased, reaching $3,040.1 million in 2014 **[5].**

As outlined above, the animal product output sector in Iraq has an important role in the Iraqi economy, but it needs ongoing support programs and technological advancements to achieve greater stability and increase its contribution to the agricultural GDP **[7]**.

Research Problem:

The research problem lies in the numerous challenges facing the livestock sector in Iraq. These challenges include population growth rates exceeding the growth rate of animal product output, coupled with limited water resources, urban encroachment on agricultural land, and insufficient investment allocations to the sector, all of which have contributed to its marginalization.

The cumulative effect of these factors has had a direct impact on the performance of the livestock sector in Iraq, particularly in areas such as the growth rate of animal product output value, which in turn has had negative repercussions on economic and agricultural development rates.

Research importance:

This study's relevance is based on the fact that the livestock sector in Iraq and worldwide. It is an important productive sector that contributes to the overall gross domestic product (GDP) by providing food products for the population and raw materials for the industrial sector, in addition to its role in employing approximately 40% of the

workforce, Interest in this sector increased following the continuous population growth and global food crises in the early 1970s, which prompted agricultural policymakers to mobilize and utilize the country's resources for the development of this sector.

Research Objectives:

This research aims to investigate the primary economic variables which impact the value of animal product output in Iraq during the period 1990-2023.

Hypothesis of the Research:

This investigation is predicated on an assumption that the worth of animal product output in the nation of Iraq is influenced by several factors, which vary in their impact on animal production during the study period. The hypotheses are as follows:

The null assumption: No association exists between factors and the worth of animal product output during the period 1990–2023.

Alternative assumption: Association exists between factors and the worth of animal product output, and this relationship varies in its impact during the period 1990–2023.

Research Methodology:

After the model is described and its variables are identified, the second stage is the estimation of model parameters using the ARDL model, which was implemented by Pesaran and Shin (1999) and developed by Pesaran et al. (2001). This model consists of two parts: the first is AR, when the dependent variable is explained by its preceding values, and the second is DL,

when the dependent variable is explained by the lagged values of the independent variables. This indicates that this is a parametric linear model [9]. Its importance lies in the fact that its application does not depend on the characteristics of the time series, whether they are stationary at level (0)I, stable at the first difference (1)I, or both. Rather, the basic condition for its application is that the time series must not be integrated at the second degree (2)I, i.e., at the second difference [12].

Previous studies

In 2023, Al-Jarjari and Al-Douri published a study on the impact of certain economic and agricultural variables on the worth of animal product output in the nation of Iraq. They explained that the livestock sector is a vital pillar of economic and social development in Iraq, and its role extends beyond ensuring food security to include providing employment opportunities, improving the trade balance, and stimulating related sectors, This research aimed to identify the most important economic and agricultural variables affecting the worth of animal product output in the nation of Iraq, using the ARDL model. The study yielded several findings, the most important of which were: The statistical importance of the following: the number of living animals, the number of killed animals, and the quantity of feed; and a long-term integration connection between the factors that were analyzed, all of which had a positive impact on the worth of animal product output. The amount of vaccines used, however, did not show

statistical significance This negatively impacted the worth of animal product output, and the researchers proposed several solutions, the most important of which were developing the livestock sector by empowering the private sector and large-scale enterprises operating in animal production, such as poultry farms and cattle breeding facilities, in addition to bolstering veterinary treatment with state-of-the-art labs and vaccinations to cure animal illnesses and boost their output [4].

In 2020, Hassan and Naima, in their study on animal product output trends and the market for red meat, explained that the livestock sector in Iraq is experiencing significant changes in red meat production and consumption caused by a multitude of variables The livestock industry is crucial to the Kurdistan Region's economy since it produces red meat and plays a large role in the region's overall growth. Cattle make up 6.7% of the total livestock population in Sulaymaniyah province, sheep 45.72%, goats 20.7%, and buffaloes 0.15%. This percentage has enabled the province to make progress in the livestock industry; however, decrease in the production of livestock due to the import of animals from abroad to meet the market demand for red meat. Examining the province's red meat manufacturing and consumption habits is the primary objective of this research. The purpose of the research in Sulaymaniyah was to find ways to increase production of animal products in the area. The researchers' key recommendations emphasized the need to develop the

livestock sector to the point where the province can achieve self-sufficiency **[13].**

Study scope:

1- Geographical scope: - Within Iraq.

2- Temporal scope: - The study period covered the years 1990-2023.

3- Subject scope: - The study examined the impact of a set of economic and production factors on the worth of animal product output, without addressing other agricultural activities (such as fisheries and forestry).

Methodological Approach

Measuring and Analyzing the Determinants of Animal product output Value in Iraq (1990-2023)

Based on previous studies that addressed the same topic, and to confirm the main research hypotheses and achieve the study objectives, a quantitative model was developed to measure and analyze the determinants of animal product output value in Iraq, Using a time series spanning 34 years (1990-2023), this was achieved by applying the Autoregressive Distributed Lag (ARDL) model, along with standard diagnostic tests before and after estimation.

First: Description and formulation of the model:

$$Y = f(X1_t, X2_t, X3_t, X4_t, X5_t, X6_t, X7_t) + U_t \ldots\ldots\ldots\ldots(1)$$

The following form will be obtained by calculating the natural logarithm of both independent and dependent factors in the equation:

$$\ln Y_t = f(\ln X1_t, \ln X2_t, \ln X3_t, \ln X4_t, \ln X5_t, \ln X6_t, \ln X7_t) + U_t \ldots\ldots..(2)$$

Because:

$n = 34$; $t = 1, 2, ..., n$; Study period (1990-2023); ln: logarithm of both sides of the equation.

Y_t: The dependent variable, representing the worth of animal product output (million US dollars).

$X1_t$: Feed production (thousands of tons).

$X2_t$:Number of agricultural workers (in thousands).

$X3_t$:Value of government subsidies to the agricultural sector (million USD).

$X4_t$: Value of agricultural loans (million USD).

$X5_t$:Value of foreign direct investment in the agricultural sector (million USD).

$X6_t$:Machinery, equipment, tractors, and towing vehicles, described by their mechanical power output (kW/horsepower).

$X7_t$:Veterinary medicines, treatments, vaccines, serums, disinfectants, and antiseptics, expressed in terms of chemical technology (per 1000 kg).

U_t : The random variable, also known as the disturbance term, includes all other unknown factors that are not incorporated into the equation but are considered to have an impact the worth of animal product output.

Second: The methodology used to estimate the model parameters:

To obtain accurate and unbiased results, the ARDL model, developed in **[14].** was used This model is one of the most important models used in applying the bounds testing approach for detecting cointegration, as well as for modeling error correction and short-term and long-term equilibrium relationships. This approach necessitates that the

duration series information be either I(0), I(1), or a mixture of both, but in no case I(2). Furthermore, this model performs better with short time series data compared to other commonly used methods for cointegration testing [1].

Thirdly: Model application and interpretation of results:

1. Time series data stationarity:

Since the Augmented Dickey-Fuller test, also known as is one of the finest ways to check for roots of units and identify the level of integration among the factors, it was used to determine the stationarity of the temporal sequence data. Additionally, the potential of recurrence in the error term was eliminated using the Akaike (Information) Criterion (AIC)[1].

This is done to test the null assumption, which assumes that the temporal sequence is stationary (has a unit root), and the alternative assumption, which assumes that the temporal sequence is non-stationary (does not have a unit root).

As shown in Table 1, all variables in the model (the dependent factor and the independent factors) were found to be non-stationary at the level. This indicates that the The null assumption, which states that these factors have a unit root, cannot be rejected; this is because the p-value for these variables was greater than 0.05. However, when the first difference of these variables was taken, they became stationary, which suggests that the ARDL model can be applied.

Table (1): Results of stability test for model variables

Variables	At Level		At First Difference	
	Intercept	Inter. & Trend	Intercept	Inter. & Trend
lnY3	-0.7036^{No} (0.8322)	-2.5662^{No} (0.2970)	-5.9810^{***} (0.0000)	-5.8605^{***} (0.0002)
lnX1	-0.4272^{No} (0.8923)	-3.5577^{**} (0.0495)	-6.5933^{***} (0.0000)	-6.5767^{***} (0.0000)
LNX2	-3.0354^{**} (0.0447)	-2.6663^{No} (0.2571)	-3.8601^{***} (0.0073)	-5.1729^{***} (0.0017)
LNX3	-1.7299^{No} (0.4075)	-3.4884^{*} (0.0572)	-4.7035^{***} (0.0008)	-4.8332^{***} (0.0029)
LNX4	-2.0342^{No} (0.2715)	-0.8436^{No} (0.9508)	-4.4367^{***} (0.0013)	-4.7281^{***} (0.0033)
LNX5	-1.9914^{No} (0.2890)	-3.1438^{No} (0.1133)	-6.8579^{***} (0.0000)	-6.7746^{***} (0.000)
LNX6	-1.5372^{No} (0.5019)	-0.2201^{No} (0.9970)	-5.7982^{***} (0.0000)	-4.4819^{***} (0.0000)
LNX7	-2.4958^{No} (0.1256)	-2.8071^{No} (0.2048)	-6.3883^{***} (0.0000)	-6.3188^{***} (0.0001)
The values in parentheses represent the probability value.				

Unit Root Test Table by: Augmented Dickey-Fuller "ADF"

Source: Constructed by the researcher in accordance with the findings of the ARDL model analysis.

2. Determine the optimal delay period for the model:

In this step, the optimal lag periods for the model variables are determined, through which the problem of

autocorrelation of the error term is eliminated. In order to determine the number of lag periods, there is a set of criteria that are used to determine the optimal lag period for the model. The Akaike Information Criterion (AIC) was relied upon to determine the optimal lag periods for the model, which rid the model of the problem of

autocorrelation of the error term [10]. It is clear from Figure (1), and through the use of the Akaike Information Criterion (AIC), that the optimal lag period is (3), and therefore the model that determines the detection of the relationship between the research variables is (3, 2, 2, 1, 2, 2, 1, 2), as shown in the figure below:
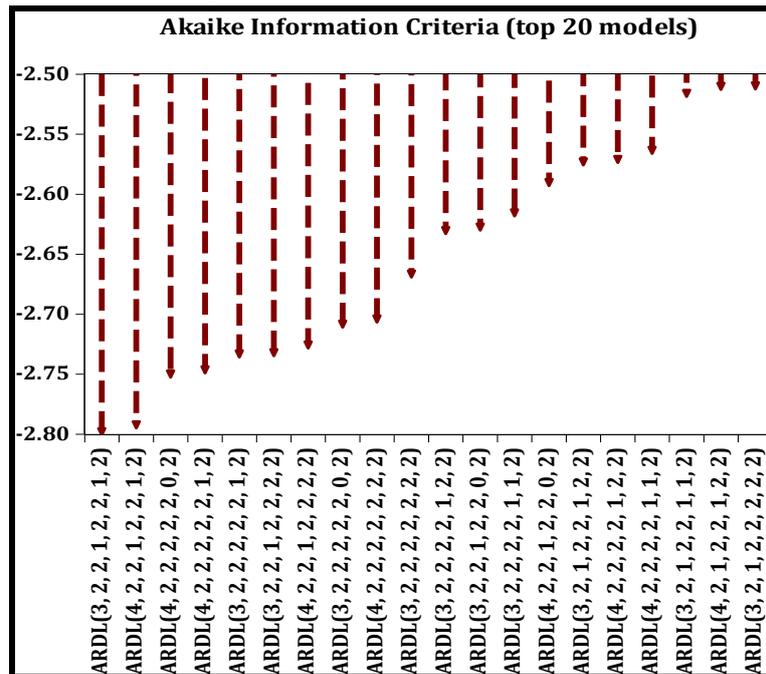

**Figure (1): Optimal lag period for the model according to the AIC criterion
Source: Constructed by the researcher in accordance with the findings of the ARDL analysis.**

3. Testing the boundary methodology:

This methodology was proposed in [15]. and is used to verify the existence of cointegration between variables or not, in other words, to verify the existence of a long-term equilibrium relationship between the model variables. This is done by comparing the calculated (F) value with the tabular

(F) values at significance levels (10%, 5%, 2.5%, 1%), respectively [2]; [3]. It is clear from Table (3) that the calculated (F) value reached (14.875), which is greater than the (F) table value

for the minimum limit of (2.17) and the maximum limit of (3.21) at a significance level of (5%). This indicates the existence of cointegration, or in other words, the existence of a long-term relationship between the

research variables.

Table (2): Cointegration test between the model variables

F-Bounds Test Null Hypothesis: No levels relationship				
Test Statistic	**Value**	**Sig. F**	**I(0)**	**I(1)**
F-statistic	**14.875127**	**10%**	**1.92**	**2.89**
		5%	**2.17**	**3.21**
K	**7**	**2.5%**	**2.43**	**3.51**
		1%	**2.73**	**3.9**

Source: Constructed by the researcher in accordance with the findings of the ARDL model analysis.

4. The error adjustment parameter and the estimation and interpretation of both short- and long-term findings:

Table (3) clearly shows the findings of the estimation the long-term and short - term relationship and the a coefficient for correcting errors, from which the following can be observed:

Short-term outcomes of the relationship and the error correction parameter:

The results showed that the a coefficient for correcting errors was (-0.596340), a negative and value that is statistically noteworthy, proving that the link between the two variables is stable over the long period. Put simply, the model has the ability to correct its own errors; approximately 60% of any deviations from equilibrium in the Iraqi economy will be corrected within one year and seven months (1/0.596340 = 1.68 ≅ 1.7 years).

✓ The production of feed impacts at the 10% level favorably and significantly significance level; this implies that a 0.01 A rise in feed production will lead to a 0.260.01 A rise in the worth of animal product output.

✓ The number of agricultural workers has a Positive affect, but it is not statistically significant; as the p-value for this parameter is greater than 0.05 at the significance level.

✓ Government subsidies targeted at the agricultural sector have a significant and positive impact at the 0.05 significance level; this implies that a 0.01 A rise in government subsidies for the agricultural sector will result in a 0.220.05 A rise in the worth of animal product output.

✓ Loans granted to the agricultural sector have a significant and positive impact at the 0.01 significance level; this implies that a 0.01 A rise in agricultural loans will result in a 0.640.05 A rise in the worth of animal product output.

✓ Foreign direct investment in the agricultural sector has a negative and Significant effect at the 0.05 significance level; this implies that a 0.01 A rise in foreign direct investment in the agricultural sector will result in a decrease in the worth of animal product output by 0.218%.

✓ The use of mechanical technology has a negative and Significant effect at

the 10% significance level; this implies that a 0.01 A rise in the use of mechanical technology will result in a 3.079% decrease in animal production value.

✓ Chemical technology has a significant and Positive affect at the 0.01 significance level; this implies that a 0.01 A rise in chemical technology will result in a 0.386% A rise in animal production value.

❖ **Long-term outcomes of the relationship:**

✓ Feed production has a significant and Positive affect at the 0.01 significance level; this implies that a 0.01 A rise in feed production will result in a 0.386% A rise in the worth of animal product output.

✓ The number of agricultural workers has a significant and positive impact at the 0.01 significance level; this implies that a 0.01 A rise in the number of agricultural workers will result in a 2.259% A rise in the worth of animal product output.

✓ Government subsidies targeted at the agricultural sector have a significant and positive impact at the 0.01 significance level; this implies that a 0.01 A rise in government subsidies for the agricultural sector will result in a 1.530% A rise in the worth of animal product output.

✓ Loans granted to the agricultural sector have a significant and positive impact at the 0.05 significance level; this implies that a 0.01 A rise in

agricultural loans will result in a 1.082% A rise in the worth of animal product output.

✓ Foreign direct investment in the agricultural sector has a negative and Significant effect at the 10% significance level; this implies that a 0.01 A rise in foreign direct investment in the agricultural sector will result in a 0.366% decrease in the worth of animal product output.

✓ The use of mechanical technology has a significant and Positive affect at the 0.05 significance level; this implies that a 0.01 A rise in the use of mechanical technology will result in a 0.494% A rise in animal production value.

✓ The chemical treatment had an adverse effect, but it was not statistically significant; as the p-value for the parameter was greater than 0.05.

❖ **The explanatory power and significance of the estimated model:**

The results indicate that the estimated model is statistically significant and of high quality, as the coefficient of determination (R^2) reached 97%. This demonstrates that the model has a high explanatory power, The remaining 3% can be attributable to other factors not included in the model or accidental error.. Furthermore, the calculated F-statistic (24.327) reflects the overall significance of the model, with a significance level of less than 0.01.

Table (3): Estimated both long and short-term results of the model

Method: ARDL(3, 2, 2, 1, 2, 2, 1, 2)				
Short Run Coefficients				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
ECM(-1)*	-0.596340	0.244498	-2.439043**	0.0406
Δ(LNX1)	0.261322	0.130627	2.000523*	0.0805
Δ(LNX2)	0.380264	0.576016	0.660162No	0.5277
Δ(LNX3)	0.224711	0.083021	2.706678**	0.0268
Δ(LNX4)	0.645389	0.069946	9.227007***	0.0000
Δ(LNX5)	-0.218053	0.052313	-4.168212***	0.0031
Δ(LNX6)	-3.078506	1.355945	-2.270377*	0.0529
Δ(LNX7)	0.385640	0.056003	6.886115***	0.0001
Long Run Coefficients				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LNX1	0.385604	0.056003	6.886115***	0.0001
LNX2	0.259929	0.044366	5.858815***	0.0004
LNX3	1.530349	0.177237	8.634476***	0.0000
LNX4	1.082250	0.437406	2.474245**	0.0385
LNX5	-0.365652	0.185809	-1.967889*	0.0846
LNX6	0.494046	0.151985	3.250618**	0.0117
LNX7	0.438585	0.304451	1.440579No	0.1877
R-squared	0.968251	**Adjusted R-squared**		0.949220
F-statistic	24.32739	**Prob. (F-statistic)**		0.000000
(*): This represents the error correction factor.				

Source: Constructed by the researcher in accordance with the findings of the ARDL model analysis.

5. The diagnostic testing phase of the model:

After estimating the model parameters, a series of diagnostic tests were conducted to ensure the quality of the estimated model's performance before its final adoption. As shown in Table (4), the diagnostic tests, which examined common issues that can arise in models used in Iraq, revealed no evidence of any such problems, indicating that the model is suitable for use.

Table 4: Diagnostic tests to check for common problems in the estimated model

The Diagnostic Checking			
Test	**Statistic**	**Value**	**Prob.**
Normality: Jarque-Bera	**Jarque-Bera**	3.2157No	0.1459
Autocorrelation: Breusch-Godfrey	**F-Statistic**	2.8643No	0.1433
	Chi-Square	4.2416No	0.5592
Heteroskedasticity: ARCH	**F-statistic**	0.6352No	0.5996
	Chi-Square	2.0596No	0.5601
Ramsey RESET Test	**t-Statistic**	0.2520No	0.8570
	F-Statistic	0.2520No	0.8570

Source: Constructed by the researcher in accordance with the findings of the ARDL model analysis.

6. Testing the structural stability of the estimated model parameters:

After estimating the error correction formula for the ARDL model, it is necessary to conduct a structural stability test for the model's short- and long-term parameters. This test ensures that the data used in the study are free of any structural changes, as well as to determine the stability and consistency of the long-term parameters with the short-term parameters. This can be done by performing one of the following two tests [6]:

• Cumulative Sum of Recursive Residual (CUSUM)
• Cumulative Sum of Squares Recursive Residual (CUSUM SQ)

Figure (2) clearly shows that the estimated parameters of the model variables exhibit a degree of structural stability throughout the study period, based on the cumulative sum of recursive residuals test. This is because the test line remains within the two boundary lines during the study period. Regarding the cumulative sum of squared recursive residuals test, it is observed that the line temporarily exceeded the upper limit during the period (2017-2018), but then returned to stability within the two boundary lines until the end of the study period. This indicates the stability of the parameters at a 0.05 significance level.
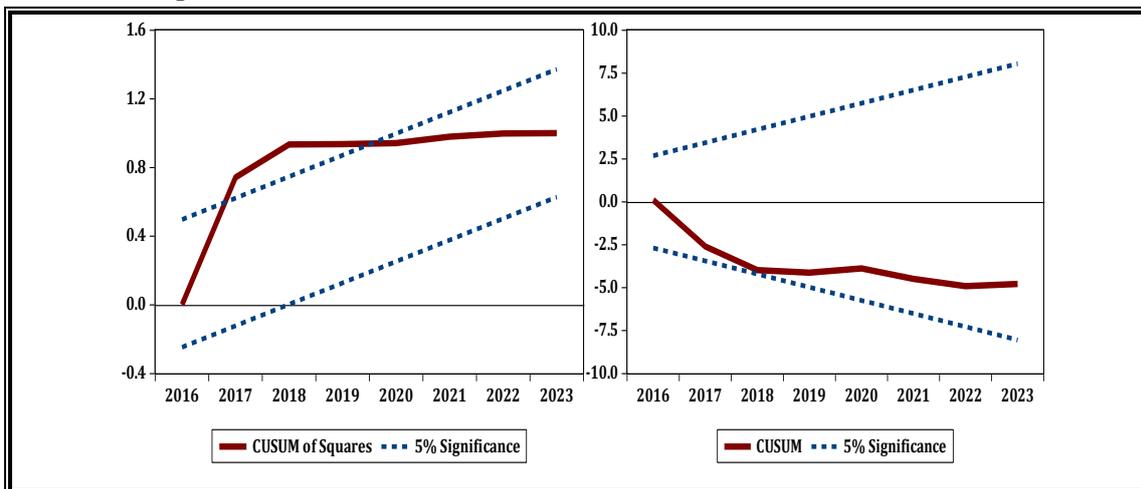

Figure (2): Test of structural stability of the estimated model parameters

7. Model Quality:

Based on the foregoing, the estimated regression model representing the relationship between the independent factors and the dependent factor (animal production value) during the period 1990-2023 was statistically significant at the 0.01 level, as indicated by the F-statistic value of 24.327. The model's explanatory power was 97%, and it did not exhibit any issues common to standard regression models. Therefore, it can be concluded that the model accurately represents this relationship and can be used reliably to predict future changes in animal production value resulting from variations in the independent factors. This is illustrated in Figure 3, which shows a strong correlation between the actual values of agricultural production (red line) and the values predicted by the autoregressive distributed lag (ADL) model (green line), along with the residuals (blue line) representing the differences between the actual and predicted values. The range of these residuals was narrow and well-
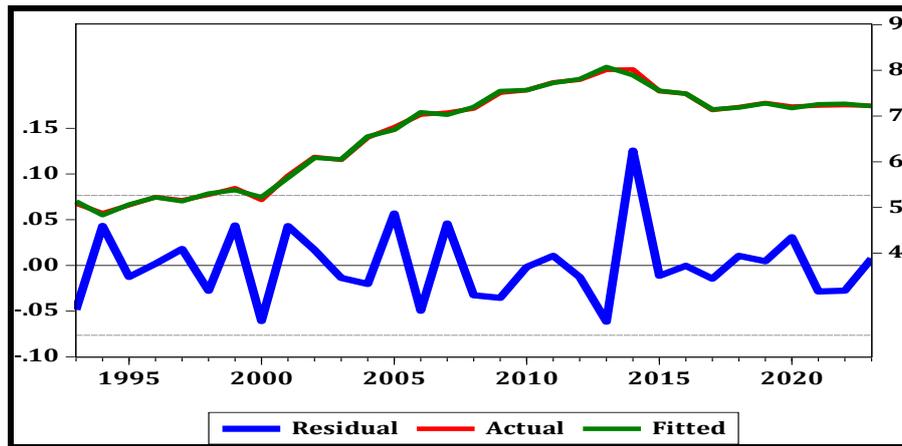
controlled.

Figure (3): Actual and predicted values of agricultural production

Source: Constructed by the researcher in accordance with the findings of the ARDL model analysis.

8. Predictive Performance Test:

Figure (4) demonstrates the anticipated outcome of the test of the framework. The results show that the error values for both RMSE and MAE were 0.038 and 0.029, respectively, which are close to zero. The lower these values, the better the predictive performance. The Theil Inequality coefficient, considered a more comprehensive indicator, also indicates that the prediction process is on the right track, with a value of 0.003, it is really near to zero. The closer this number is to zero, the better. This implies that the model's predictive performance is quite good. Regarding its three components—Bias Proportion, Variance Proportion, and Covariance Proportion—the indicators show that the prediction process effectively reduces errors, with values of 0.000, 0.000, and 0.999, respectively. This demonstrates the validity and reliability of the adopted model.
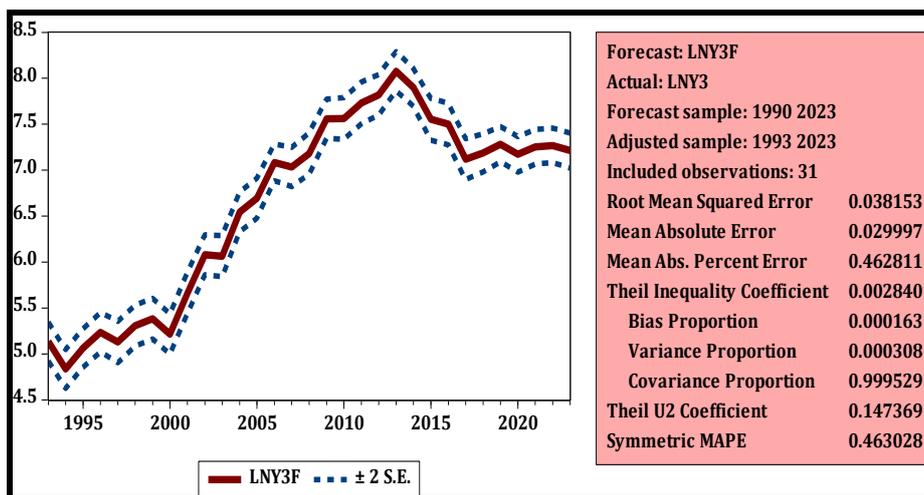

Figure (4): Actual and predicted values of the model

Conclusions:

1. Iraq has experienced abnormal economic, political, and security conditions since 2003, which has led to disruptions and a slowdown in the growth rates of several economic sectors, particularly the livestock sector. However, the results of the statistical

analysis confirmed the research hypothesis, indicating a relationship between the determinants of livestock output growth and the actual values of livestock output during the period 1990-2023.

2. The number of livestock animals increased after 2017 due to the improvement in the country's security and economic situation, and the increased focus on the livestock sector, which is considered one of the most important means of producing animal products to meet the needs of the country's population.

3. The results of the empirical analysis showed a significant positive impact of feed production, government subsidies, agricultural loans, and vaccines on animal product output. Agricultural loans had the most Significant effect on the dependent variable, while foreign direct investment and machinery and equipment had a significant but negative impact. The number of agricultural workers, however, did not show any Significant effect.

Recommendations:

1. The need to work on developing livestock by encouraging the private sector and large corporations to adopt livestock production projects. This will contribute to meeting the growing demand for animal products, achieve food security, and reduce dependence on imports.

2. Strengthening the role of the private sector in livestock production by encouraging local and foreign investments and providing the necessary official government facilities, ensuring increased production efficiency and improved quality of animal products in the local market.

3. Attention to increasing animal inputs and modernizing breeding and production processes through the introduction of modern technologies (such as fish farming) is a key factor in raising the level of livestock production and achieving integration between the livestock and sustainable agriculture sectors..

References

[1] Albajjari, A., Abdul-Majeed, A., & Albana, M. (2024). THE IMPACT OF FISCAL POLICY TOOLS ON AGRICULTURAL PRODUCTION: TÜRKIYE AS A MODEL. Mesopotamia Journal of Agriculture, 52(4), 78-87.

[2] Al-Bijari, Ahmed Ibrahim Hussein and Al-Mashhadani, Khalid Hammadi Hamdun, (2019), Measuring the Impact of Private and Foreign Direct Investment on the Unemployment Rate in [Country Name] (1985-2017), Al-Rafidain Development Journal, Supplement Issue 123, Vol. 38, Faculty of Management and Economics, University of Mosul, Mosul, Iraq.

[3] Al-Dulaimi, Malik Alam Afat. (2018). Measuring and Analyzing the Determinants of Money Demand in the Iraqi Economy for the Period (1985-2015), Unpublished Master's Thesis, University of Fallujah, College of Administration and Economics, Anbar, Iraq.

[4] Al-Jarjari, T. M.,idan & AL-Douri, B. F. latteef,(2023). The impact of some agricultural economic variables on the worth of animal product output in the nation of Iraq: An econometric study using the ADRL autoregressive distributed time lag model for the period (1990-2021). *Tikrit Journal of Administrative and Economic Sciences*, *19*(64, 1), 42–57. https://doi.org/10.25130/tjaes.19.64.1.3

[5] AL-Jumaliy, Jadooa Shehab, 2023, Econometric and Economic Analysis of the Determinants of Animal Production Revenue in Iraq During (1990-2018), Tikrit Journal of Administrative and Economic Sciences, Vol. 19, No.61, Part2.

[6] Al-Rashidi, Adi Sabour Mohammed and Al-Bajari, Ahmed Ibrahim Hussein. (2025). Measuring and analyzing the impact of fiscal policy tools on economic performance in Iraq for the period (1990-2021), Journal of Business Economics for Applied Research,

Volume 7, Issue 1, Part 2, University of Fallujah, Iraq.

[7] Arab League, Organization, Arab Organization for Agricultural Development, 2022, State of Food and Agriculture, United Nations, Rome.

[8] FAO, Food and Agriculture Organization of the United Nations (2025). Statistics Division. Viale delle Terme di Caracalla 00153 Roma, Italy.

[9] Fatukasi, Bayo, Olorunleke, Gabriel Kola, Olajide, Gbenga F, Alimi, Santos,2015, Bounds Testing Approaches to the Analysis of Macroeconomic Relationships In Nigeria, European Journal of Business and Management, Vol 07, Issue 08.

[10] Hammadi, Mustafa Fadhel. (2012). Measuring the impact of budget deficit on some macroeconomic variables for a sample of developed and developing countries for the period (1980-2009), unpublished doctoral dissertation, University of Mosul, College of Administration and Economics, Mosul, Iraq.

[11] Hamza, Yasser Tawfiq Ahmed, Economic Analysis of the Reality and Future of Demand for Some Animal Products in Egypt, journal of Agricultural Economics & Rural Development; Suez Canal University, 2020, Volume 6 (1): 121-131

[12] Hussein, Ahmed Ibrahim and Abdullah, Hashem Mohammed, 2022, The Effectiveness of Fiscal Policy Tools to Address the Imbalance in the General Budget Deficit in Selected Developing Countries for the Period (2002-2019), Tikrit Journal of Administrative and Economic Sciences, Volume 18, Issue 58, Part 1.

[13] Neima, Hemin Abubakir & Hassan, Khasraw Muheddin, 2020, Trends in Animal product output and Red Meat Industry in Sulaymaniyah Governorate, Kurdistan Region of Iraq: A Review, Journal of Animal and Poultry Production, Mansoura Univ., Vol 11 (5):189 - 192.

[14] Pesaran M, Shin Y, Smith R. (2001). Bounds Testing Approaches to The Analysis of Level Relationships, Journal of Applied Economic, Vol.16, Elsevier Science.

[15] Pesaran M, Shin Y. (1999). An Autoregressive Distributed Lag Modeling Approach to Co integration Analysis. In: Strom S (ed) Econometrics and Economic Theory in The 20th Century, The Ragnar Frisch Centennial Symposium, Cambidge University Press, Cambridge.