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FOOD CONSUMPTION IN EAST KAZAKHSTAN REGION – FOCUS ON STABILITY OF INDICATORS

ШЫҒЫС ҚАЗАҚСТАН ОБЛЫСЫНДА АЗЫҚ-ТҮЛІКТІ ТҰТЫНУ – КӨРСЕТКІШТЕРДІҢ ТҰРАҚТЫЛЫҒЫНА БАҒДАР

ПОТРЕБЛЕНИЕ ПРОДУКТОВ ПИТАНИЯ В ВОСТОЧНО-КАЗАХСТАНСКОЙ ОБЛАСТИ – ОРИЕНТИР НА СТАБИЛЬНОСТЬ ПОКАЗАТЕЛЕЙ

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Abstract. Consumption of food products by the population is an important indicator of food security, as this concept includes not only food independence, but also the availability of food products. The *aim is to* assess the relationship between economic indicators and sustainable development of agro-industrial complex in East Kazakhstan for 2012-2023, with emphasis on the impact of the existing conditions and factors on food consumption patterns. *Methods* include econometric modeling, statistical estimation, data synthesis and regression analysis to study the obtained data, identify patterns and summarize suggestions and recommendations. Innovative econometric techniques supported by Eviews 12.0 software allow the interaction between different variables to be quantified with precision. *Results* show that growth in gross regional product per capita is correlated with improvements in dietary diversity and nutritional quality, increasing food security. The authors note that fluctuations in agricultural production significantly affect food availability and

prices. An analysis of the level of food utilization is presented, which makes it possible to determine the state and prospects for the development of key branches of the agricultural sector of the region and the achievement of import substitution policy. The negative point is the problem of economic availability of food products in the region in the necessary volumes and assortment for residents with low incomes, which is caused by the growth of inflation and the decline in real money. It is shown that economic parameters explain about 95% of the variability in food consumption. The subsistence minimum plays an important role in food consumption. Its growth leads to an increase in food expenditures, which in turn affects the overall level of food consumption. Regular adjustments to social standards are needed. *Conclusions* - the possibilities of food stability in the country depend on the demand trends in the food market. There is a direct correlation between the productivity of agricultural production and the structure of consumer demand for food products. The state policy in the sphere of food consumption and provision of the population with food should include mechanisms to reduce income differences, stabilize prices, focus on balanced nutrition, and a comprehensive approach to forecasting consumer preferences.

Аңдатпа. Халықтың тамақ өнімдерін тұтынуы азық-түлік қауіпсіздігінің маңызды көрсеткіші болып табылады, өйткені бұл тұжырымдама азық-түлік тәуелсіздігін ғана емес, сонымен қатар азық-түлік тауарларының қолжетімділігін де қамтиды. *Мақсат* – 2012-2023 жылдар аралығында Шығыс Қазақстанның агроөнеркәсіп кешенінің экономикалық көрсеткіштері мен тұрақты даму арасындағы өзара байланысты бағалау, тұтыну модельдеріне әсер еткен жағдайлар мен факторлардың ықпалын атап көрсету. *Әдістерге* эконометриялық моделдеу, статистикалық бағалау, деректерді синтездеу және регрессиондық талдау жатады, олар алынған деректерді зерттеуге, заңдылықтарды анықтауға және ұсыныстар мен кеңестерді жалпыға түйіндеуге мүмкіндік береді. Eviews 12.0 бағдарламалық қамтамасыз етуі қолдауымен инновациялық эконометриялық техникалар әртүрлі айнымалылар арасындағы өзара байланысты сандық тұрғыдан дәл бағалауға мүмкіндік береді. *Нәтижелер* көрсеткендей, жан басына шаққандағы жалпы өңірлік өнімнің өсуі тамақтану әртүрлілігінің және тамақ сапасының жақсаруымен корреляцияланады, бұл азық-түлік қауіпсіздігін арттырады. Авторы ауылшаруашылық өндірісіндегі өзгерістердің азық-түліктің қолжетімділігі мен бағаларына елеулі әсер ететінін атап өтеді. Негізгі аграрлық сектордың жағдайы мен дамуының перспективасын анықтауға мүмкіндік беретін азық-түлікті пайдалану деңгейін талдау ұсынылған. Негативті фактор ретінде төмен табысы бар тұрғындар үшін қажетті көлемде және ассортиментте азық-түлік тауарларының экономикалық қолжетімділігі мәселесі инфляцияның өсуі мен нақты ақшаның азаюымен байланысты. Экономикалық параметрлер азық-түлік тұтынуындағы өзгерістердің 95%-ын түсіндіреді. Тіршілік минимумының тамақ өнімдерін тұтынуда маңызды рөлі бар. Оның өсуі тамақтануға шығындардың артуына әкеледі, бұл жалпы азық-түлік тұтыну деңгейіне әсер етеді. Әлеуметтік стандарттарды тұрақты түрде түзету қажеттілігі туындайды. *Қорытындылар* – елдегі азық-түлік тұрақтылығының мүмкіндіктері азық-түлік нарығындағы сұраныстың өзгеру тенденцияларына байланысты. Ауылшаруашылық өндірісінің өнімділігі мен азық-түлік тауарларына деген тұтынушылық сұраныс құрылымы арасында тікелей корреляция бар. Азық-түлікті тұтыну және халықты азық-түлікпен қамтамасыз ету жөніндегі мемлекеттік саясат табыс айырмасын азайту, бағаларды тұрақтандыру, теңгерімді тамақтануға бағытталу, тұтынушылық таңдауларды болжауға кешенді тәсілді қамтуы тиіс.

Аннотация. Потребление населением пищевых продуктов является важным индикатором продовольственной безопасности, так как в данном понятии заложены не только продовольственная независимость, но и доступность продовольственных товаров. *Цель* – оценка взаимосвязи между экономическими показателями и устойчивым развитием агропромышленного комплекса в Восточном Казахстане за 2012-2023гг., с акцентом влияния сложившихся условий и факторов на модели потребления продовольствия. *Методы* включают эконометрическое моделирование, статистическую оценку, синтез данных и регрессионный анализ для изучения полученных данных, выявления закономерностей и обобщения предложений и рекомендаций. Инновационные эконометрические техники, поддерживаемые программным обеспечением Eviews 12.0, позволяют с точностью количественно оценить взаимодействие между различными переменными. *Результаты* показывают, что рост валового регионального продукта на душу населения коррелируется с улучшением диетического разнообразия и качества питания, повышая продовольственное обеспечение. Авторы отмечают, что колебания в сельскохозяйственном производстве значительно отражаются на доступности и ценах на продукты питания. Представлен анализ уровня использования пищевых продуктов, который дает возможность определить состояние и перспективы развития ключевых отраслей аграрного сектора области и достижения политики импортозамещения. Негатив-

ным моментом является проблема экономической доступности продовольственных товаров в регионе в необходимых объемах и ассортименте для жителей с низкими доходами, что обусловлено ростом инфляции и снижением реальных денежных средств. Показано, что экономические параметры объясняют около 95% изменчивости в потреблении продовольствия. Прожиточный минимум играет важную роль в потреблении продуктов питания. Его рост приводит к увеличению расходов на питание, что, в свою очередь, отражается на общем уровне потребления пищевых продуктов. Необходимы регулярные корректировки социальных стандартов. *Выводы* - возможности продовольственной стабильности в стране зависят от тенденций изменения спроса на продовольственном рынке. Существует прямая корреляция между производительностью аграрного производства и структурой потребительских запросов на продовольственные товары. Государственная политика в сфере потребления продовольствия и обеспечения населения продовольствием должна включать механизмы снижения разницы в доходах, стабилизацию цен, ориентацию на сбалансированное питание, комплексный подход к прогнозированию потребительских предпочтений.

Key words: agro-industrial complex, sustainable development, food consumption, availability of food products, consumer trends, food security.

Түйінді сөздер: агроөнеркәсіптік кешен, тұрақты даму, азық-түлікті тұтыну, азық-түлік тауарларының қолжетімділігі, тұтынушылық тенденциялар, азық-түлік қауіпсіздігі.

Ключевые слова: агропромышленный комплекс, устойчивое развитие, потребление продуктов питания, доступность продовольственных товаров, потребительские тенденции, продовольственная безопасность.

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Introduction

Food security is particularly vulnerable to risks arising from economic and environmental shocks. From 2000 to 2022, there were three major shocks: the global financial crisis of 2008-2009, which led to the most significant decline in global economic activity in modern times; the global COVID-19 pandemic; and the Russian military invasion of Ukraine. According to Owen Davis and Ben Geiger, the 2008 crisis increased the number of people suffering from hunger by 97 million more than in 2007 (Davis O., Geiger B.B.) [1]. COVID-19 resulted in an additional 112.6 million people becoming hungry, and the conflict in Ukraine sharply increased those at high risk of food insecurity, reaching a record level of 345 million.

The volume and structure of food consumption per capita are key indicators of human nutritional needs satisfaction (Aidarova A.B., Abdikhalyk S.M.) [2]. Food security, linked to food production and consumption, has been a critical issue in Kazakhstan. The undernutrition rate was 6.5% in the early 2000s and has been trending upwards. According to FAO, since 2009, there have been improvements, but the rate of moderate or acute food shortage increased from 2.1% in 2017-2019 to 2.7% in 2019-2021, reflecting the impact of the COVID-19 pandemic. Food security remains a primary goal of Kazakhstan's agricultural and economic policy, essential for national security (Kaldiyarov D.A., Dulambayeva R.T., Bedelbayeva A.E.) [3].

Furthermore, the uneven distribution of food insecurity risk among social groups exacerbates the challenge of targeting support effectively, as indicated by FAO, WFP, and other sources.

The unexpected Russian invasion of Ukraine, which significantly impacted Kazakhstan's economy, has made achieving the goals of the National Plan more difficult (Agaidarov A., Rahardja S.) [4]. As a close economic partner of Russia, Kazakhstan faces negative impacts from sanctions and other external shocks. Rapidly rising inflation poses a serious threat as an import-dependent country, leading to a decline in living standards and reduced purchasing power. The long-term trade ties with Ukraine expose Kazakhstan to secondary effects like rising food prices, which negatively affect food availability and security. The instability of the national currency rate further exacerbates these issues.

This introduction sets the stage for thoroughly analyzing how various economic factors influence food consumption and security in East Kazakhstan, highlighting the critical need for effective, robust policy responses to maintain and enhance food security in the face of ongoing significant economic challenges.

Literature review

The relationship between economic indicators and food consumption patterns has been a significant area of study in agricultural and economic research. Research has demonstrated that regional agricultural productivity is a critical driver of local food availability and consumption patterns. In East Kazakhstan, where agriculture plays a vital role, the output significantly influences dietary choices through its impact on local markets and prices (Lin T.Y., Chiu S.Y., Chiu Yh. et al.) [5]. The influence seamlessly connects to broader economic prosperity, as reflected in the region's GRP.

Higher GRP per capita is associated with improved dietary quality and diversity because households have more disposable income to spend on food (Beckman J., Baquendano F., Countryman A.) [6]. However, it also raises concerns about the adequacy of income to cover essential needs, exemplified by the average subsistence minimum.

Average subsistence minimum in thousands of tenge, highlights the minimal income required to cover essential living expenses, including food. Gerbens-Leenes P.W., Nonhebel S., Krol M.S. [7] highlighted that lower subsistence levels are often linked with compromised food security and nutritional quality, affecting various demographic groups differently, especially in terms of household size.

The influence of average household size is profound, as it directly affects consumption patterns. Larger households might benefit from economies of scale in food purchases, but they also face increased challenges in satisfying the nutritional needs of all members (Drammeh W., Hamid N.A., Rohana A.J.) [8]. This demographic factor closely ties with the overall population trends within the region.

Average annual population addresses the influence of demographic changes on food demand and consumption trends. As Goran Miladinov noted, population growth can strain food resources, potentially leading to greater food insecurity if increases in food availability do not match demographic expansions (Miladinov G.) [9].

Food price index is crucial in determining the accessibility of nutritious food. High food price indices can restrict access to quality food, especially for lower-income households, leading to poorer food choices and increased health risks (Beydoun M.A., Powell L.M., Chen X. et al.) [10]. This economic measure interacts directly with income distribution within the region, as reflected by the Gini index.

The Gini index measures income inequality, a pivotal socio-economic factor. Higher Gini coefficients often result in significant disparities in food quality and consumption across different socio-economic groups (Mookodi L.) [11]. This inequality impacts how effectively different households can respond to economic pressures, including those related to food prices and availability.

Materials and methods

The article investigates the impact of economic indicators on food security in East Kazakhstan, utilizing data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. The study employs multiple regression analysis facilitated by Eviews 12.0 software, focusing on variables such as agricultural output, GRP per capita, and the average subsistence minimum.

Research methods include econometric modeling, systematic analysis, and statistical evaluation. Data synthesis and regression analysis explore relationships between economic factors and food consumption across various categories: bakery products, meats, dairy, and vegetables. This methodological approach allows for detailed examination of how economic shifts influence dietary patterns and food security.

Eviews 12.0 supports extensive data manipulation and statistical testing, ensuring rigorous analysis. The combination of correlation and multiple regression analysis provides a nuanced understanding of economic impacts on food consumption, affirming the statistical significance of the relationships and underpinning policy recommendations to enhance food security amidst economic fluctuations. This comprehensive analysis offers crucial insights into the complex dynamics between economic stability and food security in the region.

Results

The empirical examination of economic indicators in East Kazakhstan from 2019 to 2023 provides a quantifiable basis for understanding shifts in the region's food consumption patterns. This period encompasses significant global and local events that potentially influenced these economic indicators, thereby affecting the regional dietary habits. The following analysis delves into various economic metrics, such as gross agricultural output, GRP per capita, and the average subsistence minimum, among others, to assess their trends over the five years and infer their impact on food security and consumption behaviors (table 1).

The agricultural sector in East Kazakhstan has exhibited significant growth with a 48.7% increase in gross agricultural output from 2019 to 2023, despite a notable decline of 14.8% in

2023 compared to 2022. This volatility may be attributed to external shocks that impacted the sector in 2022, potentially influencing the stability of local food markets. Fluctuations in agricultural production are critical as they directly affect the availability and prices of food products, which in turn can influence the region's food security. Such changes underscore the dependency of local food systems on the agricultural sector's stability, impacting everything from market prices to the availability of food products for consumers.

Table 1 - Assessment of economic indicators of development in the East Kazakhstan region, 2019-2023

Indicator	Year						
	2019	2020	2021	2022	2023	2023 to 2019, %	2023 to 2022, %
Gross agricultural output, million tenge	591 980.4	691 267.4	875 640.5	1 033 389.6	880 438.6	148.7	85.2
GRP per capita, million tenge	2 929.2	3 369.8	3 723.0	5 353.8	6 135.4	209.5	114.6
Average subsistence minimum, thousand tenge	29.5	33.4	37.8	45.0	50.9	172.5	113.1
Average household size	3.4	3.4	3.4	3.4	3.4	100.0	100.0
Average annual population, thousands	1374.1	1 366.7	1 360.1	1 342.1	1 337.3	97.3	99.6
Food price index	105.5	107.3	109.1	120.0	110.1	104.4	91.8
Gini coefficient	0.29	0.29	0.29	0.29	0.29	100.0	100.0

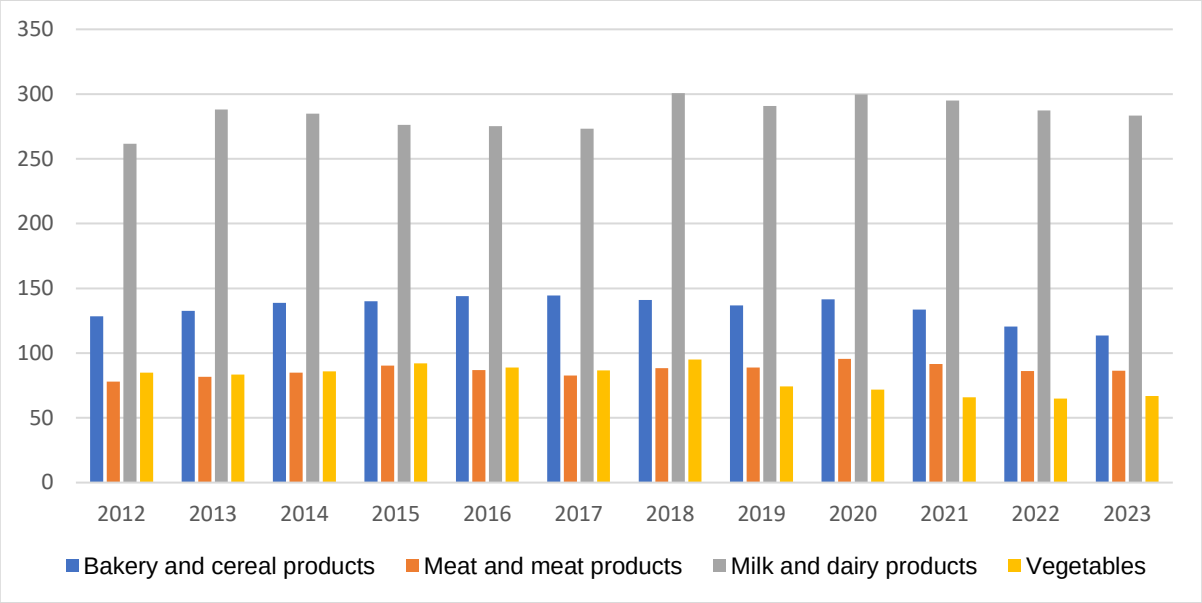
Note: calculated by the authors based on data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, 2019-2023.

Economically, the region has seen profound changes as evidenced by the 209.5% surge in GRP per capita over the same period, with a substantial increase of 14.6% in the last year alone. This remarkable economic growth likely facilitated greater dietary diversity and improved nutritional quality, driven by increa--sed household spending power. However, alongside economic gains, the average subsistence minimum also rose by 72.5%, indicating that the cost of living has been climbing, potentially placing a strain on lower-income families.

Despite higher average incomes, this increase in basic living costs could hinder access to nutritious food for more economically vulnerable populations. Moreover, the consistent Gini coefficient suggests that income inequality has remained static, potentially perpetuating existing disparities in food access and quality across different social strata. These dynamics highlight the complex interplay between economic growth, cost of living, and food security in shaping the dietary patterns and health of the population in East Kazakhstan.

The bar chart (figure) illustrating food consumption per capita in kilograms in the East Kazakhstan region from 2012 to 2023 shows distinct trends across various food categories. Notably, meat and meat products exhibit a consistent upward trend in consumption, suggesting increasing consumer preference or improved economic ability to purchase higher-priced food items. Conversely, consumption of bakery and cereal products remains relatively stable, indicating a staple status in the diet that is less affected by economic changes. Milk and dairy products, along with vegetables, display more variability, with noticeable fluctuations that may reflect sensitivity to changes in prices or agricultural output. This variability underscores the impact of economic factors, such as income levels and food prices, on consumer choices regarding more perishable and price-sensitive food categories.

In this study, a correlational-regression model is used to determine the relationship between one of the most important indicators of food security – food consumption and indicators characterizing the economy of the region and its agriculture. For this purpose, the method of multiple regression between variables in the East Kazakhstan region will be used.



Note: based on data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, 2012-2023.

Figure – Food consumption per capita in kilograms by the population in the East Kazakhstan region, 2012-2023

A paired regression model was created with independent variables (X) – gross output of crop and livestock production in millions of tenge – CROP/LIVESTOCK (X1), GRP per capita in millions of tenge - GRP (X2), average subsistence minimum in thousands of tenge - AV_SUBS_L (X3), average household size – AV_HH (X4), average annual population - PEOPLE (X5), food price index – FOOD_PRICES (X6), Gini coefficient – GINI (X7). The dependent variable is the consumption of food products in kilograms per capita per year (Y) – bakery and cereal products (BAKERY), meat and meat products (MEAT), milk and dairy products (MILK), vegetables (VEGETAB). The results of the multiple regression are numerically presented in tables 2,3.

Table 2 - Results of multiple regression for the consumption of bakery and cereal products in the East Kazakhstan region

Dependent Variable: BAKERY Method: Least Squares Date: 05/27/24 Time: 15:29 Sample: 2012 2023 Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CROP	-0.11	0.42	-0.26	0.81
GRP	0.54	0.98	0.55	0.61
AV_SUBS_L	0.70	1.17	0.59	0.58
AV_HH	-0.43	0.23	-1.84	0.14
PEOPLE	2.23	1.35	1.65	0.17
FOOD PRICES	0.14	0.16	0.85	0.44
GINI	0.63	0.22	2.85	0.05
C	-1.09	1.68	-0.65	0.55
R-squared	0.95	Mean dependent var		0.32
Adjusted R-squared	0.87	S.D. dependent var		0.31
S.E. of regression	0.11	Akaike info criterion		-1.30
Sum squared resid	0.05	Schwarz criterion		-0.97
Log likelihood	15.78	Hannan-Quinn criter.		-1.42
F-statistic	11.36	Durbin-Watson stat		2.76
Prob (F-statistic)	0.02			
Note: compiled by the authors				

As can be seen from the data according to the table 2, the model constructed using the least squares method shows the following results for the dependent variable of bread consumption in the context of economic indicators for the period from 2012 to 2023. The regression equation is as follows:

$$Y = -0,11*X_1+0,54*X_2+0,70*X_3-0,43*X_4 +2,23*X_5+0,14*X_6+0,63*X_7-1,09$$

The regression analysis of bread consumption in East Kazakhstan illustrates complex relationships between economic indicators and dietary choices. The negative coefficient for the CROP variable suggests that an increase in gross agricultural output does not lead to a proportional increase in bread consumption, possibly due to an improved variety in the diet. Conversely, positive associations with GRP and AV_SUBS_L indicate that increases in GRP and the subsistence minimum are linked to higher bread consumption, reflecting rises in income and purchasing power. The positive coefficient for GINI suggests that higher income inequality correlates with increased bread consumption, likely because bread is a more affordable food option for economically pressured lower-income groups.

The model demonstrates a high explanatory power with an R-squared value of 0.95, indicating that about 95.21% of the variation in bread consumption is explained by the proposed economic factors. The adjusted R-squared value of 0.87 confirms that the model adequately reflects the data, considering the number and influence of independent variables. The Fisher F statistic is 11.36 with a Prob (F-statistic) of 0.02, suggesting the model is statistically significant at approximately a 98.33% confidence level, indicating only about a 1.67% chance that the observed results could occur by chance if there were no actual relationships between the variables. This analysis substantiates that economic factors significantly influence food consumption patterns of bread in the East Kazakhstan region.

As can be seen from the data according to the table 3, the model constructed using the least squares method shows the following results for the dependent variable of meat consumption in the context of economic indicators for the period from 2012 to 2023. The regression equation is as follows:

$$Y = -9,91*X_1-5,16*X_2+9,79*X_3-0,60*X_4 -3,59*X_5+0,56*X_6+0,07*X_7+5,97$$

Table 3 – Results of multiple regression for the consumption of meat and meat products in the East Kazakhstan region

Dependent Variable: MEAT Method: Least Squares Date: 05/27/24 Time: 15:34 Sample: 2012 2023 Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CROP	-9.91	2.11	-4.69	0.01
GRP	-5.16	0.95	-5.46	0.01
AV_SUBS_L	9.79	2.31	4.23	0.01
AV_HH	-0.60	0.19	-3.18	0.03
PEOPLE	-3.59	1.14	-3.17	0.03
FOOD PRICES	0.56	0.12	4.54	0.01
GINI	0.07	0.25	0.29	0.78
C	5.97	1.42	4.19	0.01
R-squared	0.96	Mean dependent var		0.50
Adjusted R-squared	0.89	S.D. dependent var		0.27
S.E. of regression	0.09	Akaike info criterion		1.77
Sum squared resid	0.03	Schwarz criterion		-1.45
Log likelihood	18.64	Hannan-Quinn criter.		-1.89
F-statistic	13.81	Durbin-Watson stat		2.65
Prob (F-statistic)	0.01			
Note: compiled by the authors				

The analysis of meat consumption in East Kazakhstan through a regression model reveals nuanced relationships between economic factors and dietary preferences. The variable LIVESTOCK, with a significant negative coefficient, suggests that increased gross livestock production does not proportionally enhance meat consumption, possibly

due to heightened exports or improved production efficiencies. Conversely, positive relationships with GRP and the average subsistence minimum (AV_SUBS_L) imply that increases in these economic indicators are associated with higher meat consumption, reflecting rising incomes and purchasing power. Additionally, a slight positive coefficient for the Gini coefficient indicates that as income inequality rises, meat consumption slightly increases, potentially because meat is a more expensive food choice under economic pressures affecting the poorer segments of the population.

The model's R-squared value of 96.03% indicates that about 96% of the variation in meat consumption is explained by these economic factors, underscoring the strong influence of economic conditions on food consumption patterns. The adjusted R-squared value of 0.89 confirms the model's adequacy in reflecting the data considering the number and impact of the independent variables. The Fisher's F-statistic of 18.64 with a Prob (F-statistic) of 0.01 demonstrates the model's overall statistical significance at a confidence level of approximately 98,84%, suggesting only about a 1,16% chance that the observed results could occur by chance if there was no actual relationship between the variables. Thus, this analysis substantiates that economic factors significantly impact meat consumption patterns in the East Kazakhstan region.

As can be seen from the data according to the results of multiple regression for the consumption of milk and dairy products in the East Kazakhstan region, the model constructed using the least squares method shows the following results for the dependent variable of milk consumption in the context of economic indicators for the period from 2012 to 2023. The regression equation is as follows:

$$Y = -9,97*X_1-1,46*X_2+6,90*X_3-0,47*X_4 -4,36*X_5-0,26*X_6-0,58*X_7+5,85$$

The regression model analyzing milk consumption in East Kazakhstan reveals several significant relationships between milk consumption and various economic indicators. The variable LIVESTOCK shows a significant negative coefficient, suggesting that increases in livestock production do not lead to proportional increases in milk consumption, possibly due to increased exports or more efficient use of production outputs. The negative association with GRP implies that as GRP per capita increases, milk consumption decreases, possibly reflecting shifts in consumer preferences or the availability of alternative nutritional sources. In contrast, the variable AV_SUBS_L demonstrates a positive relationship, indicating that increases in the average subsistence minimum are associated with increased milk consumption, likely due to improved access to dairy products for broader population segments.

The model's explanatory power is high, with an R-squared value of 0.90, indicating that approximately 89.75% of the variation in milk consumption is explained by these economic factors. The adjusted R-squared value of 0.72 validates the model's adequacy, reflecting the data considering the number and impact of the independent variables. The Fisher's F-statistic of 5.00 with a Prob (F-statistic) of 0.07 confirms the model's overall statistical significance at a confidence level of about 93.06%, suggesting a very low probability (about 6.94%) that the observed results could occur by chance if there was no actual relationship between the variables. This analysis corroborates the significant influence of economic factors on milk consumption patterns in East Kazakhstan, underscoring the need to consider these dynamics in food security and economic policy planning.

As can be seen from the data according to the results of multiple regression for the consumption of vegetables in the East Kazakhstan region, the model constructed using the least squares method shows the following results for the dependent variable of vegetables consumption in the context of economic indicators for the period from 2012 to 2023. The regression equation is as follows:

$$Y = -0,96*X_1+2,63*X_2+3,79*X_{3+}0,48*X_4 +4,95*X_5-0,26*X_6-0,37*X_7-4,88$$

The regression analysis for vegetable consumption in East Kazakhstan reveals various economic influences. The negative coefficient for CROP suggests that an increase in the gross output of agricultural crops might lead to a decrease in vegetable consumption, potentially due to shifts in agricultural focus or market saturations. In contrast, significant positive correlations with GRP and AV_SUBS_L indicate that vegetable consumption increases alongside economic prosperity and better access to resources, reflecting a higher standard of living. Additionally, the variable PEOPLE shows a strong positive effect, indicating that vegetable consumption rises with population growth.

The model's explanatory power is robust, with an R-squared of 0.95, suggesting that about 95.47% of the variation in vegetable consumption is explained by these economic indicators. The adjusted R-squared of 0.87 confirms the model's adequacy, considering the number and impact of the

independent variables. The Fisher F-statistic of 14.04 with a Prob (F-statistic) of 0.01 confirms the statistical significance of the model at a confidence level of approximately 98.5%, suggesting that the observed results are highly unlikely to be due to chance. This analysis substantiates the significant impact of economic factors on vegetable consumption patterns in the East Kazakhstan region, highlighting the importance of economic conditions in shaping dietary behaviors.

Discussion

The analysis underscores the complex relationship between economic indicators and food consumption patterns in East Kazakhstan. Our findings reveal significant influences from variables such as agricultural output, GRP, and food prices on dietary choices and nutritional quality in the region.

Agricultural output is crucial for food security, influencing food availability and affordability. This aligns with Pawlak K., Kołodziejczak M. [12], who highlighted the role of local agriculture in sustaining food levels during economic downturns. Given East Kazakhstan's reliance on agriculture, fluctuations in this sector markedly affect food consumption patterns.

GRP is a strong determinant of dietary diversity, corroborating (Bairagi S., Mohanty S., Baruah S. et al.) [13] research that higher GRP correlates with increased spending on diverse and nutritious food. However, this relationship is nuanced by the average subsistence minimum, which identified as vital in defining food security thresholds.

Household size and population dynamics introduce further complexities. As Mengistu Maja and Samuel Ayano noted, larger households and growing populations strain food resources, requiring robust agricultural outputs and economic strategies to prevent food insecurity (Maja M.M., Ayano S.F.) [14].

High food prices disproportionately impact lower-income households, limiting access to nutritious food (Green R., Cornelsen L., Dangour A. D.et al.) [15]. The Gini coefficient reflects disparities in food consumption, which are exacerbated by economic shocks and severe in regions with stark economic divides.

Our study reinforces the importance of economic stability for ensuring food security. The analysis reveals that economic shocks impact socio-economic groups differently within East Kazakhstan. Consequently, food security policies must address these complex relationships, tailoring strategies to meet the region's specific economic and demographic needs.

Conclusions

The comprehensive analysis in this article on the effects of economic indicators on food consumption patterns in East Kazakhstan has highlighted several key points:

1. The study illustrates how significant economic events, such as the global financial crisis, the COVID-19 pandemic, and geopolitical tensions, have substantial impacts on food security. These events disrupt economic stability and exacerbate food insecurity by influencing both availability and access to food resources.

2. The data indicates a direct correlation between agricultural productivity and food consumption patterns. Fluctuations in the gross agricultural output, particularly in a region heavily reliant on agriculture like East Kazakhstan, significantly affect food availability and pricing, thereby impacting consumption.

3. Increased GRP per capita has been associated with improved dietary diversity and nutritional quality. This relationship underscores the importance of economic growth in enhancing food security through increased household income, which facilitates access to a variety of nutritious foods.

4. The findings also reveal the role of socio-economic factors, such as income inequality measured by the Gini coefficient, in determining food consumption patterns. Higher income inequality tends to limit access to nutritious food among lower-income groups, highlighting the need for targeted policy interventions.

5. The utilization of multiple regression analysis and the robust statistical methods provided by Eviews 12.0 have substantiated the significant influence of economic factors on food consumption. The high R-squared values indicate that a considerable portion of the variability in food consumption patterns can be explained by the economic indicators studied.

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