

Population Growth and Food Security in Algeria ; an Econometric Study (1980-2024)

النمو السكاني والأمن الغذائي في الجزائر؛ دراسة اقتصادية قياسية (1980-2024)

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Abstract

Keywords

This study aims to estimate the relationship between food security and population growth in Algeria using linear regression based on the ordinary least squares method, on annual data from 1980 to 2024. We used data on the annual population growth rate and annual wheat production (in tons) as an indicator of food security. The results showed a significant negative relationship between the population growth rate and food security; however, this relationship was not strong, indicating the presence of other variables that also affect food security in Algeria.

Population Growth ;
Food Security;
Wheat Production ;
Linear Regression

JEL Classification Codes : Q18 ; Q56

الكلمات المفتاحية

الملخص

النمو السكاني؛
الأمن الغذائي؛
إنتاج القمح؛
الانحدار الخطي

تهدف هذه الدراسة إلى تقدير العلاقة بين الأمن الغذائي والنمو السكاني في الجزائر باستخدام الانحدار الخطي القائم على طريقة المربعات الصغرى العادية، وذلك بالاعتماد على بيانات سنوية للفترة من 1980 إلى 2024. وقد استخدمنا بيانات معدل النمو السكاني السنوي وإنتاج القمح السنوي (بالطن) كمؤشر للأمن الغذائي. أظهرت النتائج وجود علاقة سلبية معنوية بين معدل النمو السكاني والأمن الغذائي؛ إلا أن هذه العلاقة لم تكن قوية، مما يشير إلى وجود متغيرات أخرى تؤثر أيضاً على الأمن الغذائي في الجزائر.

تصنيف JEL: Q18 ؛ Q56

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I.INTRODUCTION:

Food security is a fundamental human right, enabling individuals to live healthy lives by ensuring access to sufficient, nutritious, and safe food that meets their needs at all times. It is linked to several economic, climatic, demographic, and agricultural factors. In this context, our study aims to analyze the impact of population growth on food security in Algeria and to answer the following question: Does population growth affect food security in Algeria?

From this problem, we pose the following sub-questions:

What is the trend of population growth in Algeria?

Is Algeria food secure?

Is population growth a factor hindering food security in Algeria?

Our study posits that there are economic and natural factors contributing to food insecurity in Algeria, and population growth is one of them.

Objectives of the study:

Identifying Algeria's position according to food security indicators;

Identifying the historical evolution of population in Algeria;

Determining the relationship between population growth and food security in Algeria.

Study Tools:

Our study relies on data from the World Bank (WDI databank), the Food and Agriculture Organization (FAO), and the Global Food Security Index to analyze Algeria's position among the countries of the world.

To study the relationship between food security and population growth, we employ linear regression using the ordinary least squares method. The study period extends from 1980 to 2024.

II. THEORETICAL FRAMEWORK AND PREVIOUS STUDIES:

1. Previous studies:

To enrich our research, we relied on several sources, including those that focused on the impact of population growth, such as the United Nations report on sustainable development, nutrition, and population, which addressed the relationship between population growth and food waste (United Nation, 2021). A report by the Berlin Institute for Population and Development on the need to adapt food security strategies to changing population dynamics (Berline Institute for population and development, 2024); the negative impact of population growth on agricultural production in Nigeria (O. Anyanwu & al, 2022); and food insecurity due to population growth in Pakistan (Khalil & Ali,

2016); as well as studies focusing on Algeria, such as those on the determinants of the food gap and food security (Belaidi, 2025) who founded that total population had positive significant effect on food gap during the period (2000-2022) ; (Rahal & Tahri, 2022) using an ARDL approach found that total population had positive effect on wheat gap (Dekkiche, Saidi, & Cherayett, 2025), using Panel_ARDL model on developing countries within Algeria to identify food security determinants, the study found that total population had a negative impact on food security index during the period (1990-2023) ; (Benkheznadji, 2024), studied the reality of food security in Algeria and concluded that Algeria tried to achieve food security through many efforts and policies especially in COVID_19 crisis. In addition, (Belgaid & Ouchalal, 2024) presented a study on food insecurity and food dependency , the study concluded that Algeria had a deficit in her agricultural balance and this could lead to food crisis ; (Rahmani, 2020) found that the level of food security in Algeria was below the good in 2019.

These studies demonstrate that food security is a global phenomenon determined by a range of factors that affect it both positively and negatively. These factors relate to the food gap and the availability of food for a number of people in changing economic and natural conditions.

2.Evolution of population in Algeria:

One of the most famous population theories is Malthus's population theory, which states that every twenty-five years, population growth increases faster than the rate of food production.

According to Malthus, population growth follows a geometric progression, while food production follows an arithmetic progression, meaning that the increase in population exceeds the increase in food production.

Table (1) shows the annual evolution of the total population of Algeria from 1960 to 2024.

**Table (01): annual evolution of the total population of Algeria
from 1962 to 2024**

Years	Total	Years	Total	Years	Total
1962	11800771	1983	20558115	2004	32628286
1963	11982118	1984	21271969	2005	33109249
1964	12179813	1985	22008544	2006	33623506
1965	12365976	1986	22745499	2007	34189416
1966	12590069	1987	23443624	2008	34816961
1967	12876118	1988	24109536	2009	35490445
1968	13172614	1989	24754485	2010	36188236
1969	13475960	1990	25375810	2011	36903376
1970	13783719	1991	25987928	2012	37646166
1971	14098936	1992	26628568	2013	38414171
1972	14427072	1993	27277048	2014	39205031
1973	14771147	1994	27887279	2015	40019529
1974	15133502	1995	28470191	2016	40850721
1975	15678596	1996	29033044	2017	41689299

1976	16409170	1997	29579301	2018	42505035
1977	17015994	1998	30054133	2019	43294546
1978	17506974	1999	30474354	2020	44042091
1979	18036655	2000	30903893	2021	44761099
1980	18607174	2001	31331221	2022	45477389
1981	19220704	2002	31750835	2023	46164219
1982	19872348	2003	32175818	2024	46814308

Source: (World Bank Database, 2026)

The population of Algeria has experienced a continuous annual increase, growing from 1962 to 2024. Table 2 shows population doubling rate during sub periods of 25 years.

Table (02): Population doubling rate during (1962-2024)

Period		Initial population	Final Population	Population doubling rate
1962-1987	25 years	11800771	23443624	1.98
1987-2012	25 years	23443624	37646166	1.65
1999-2024	25 years	30474354	46814308	1.54

Source: By the researcher from table (01)

The population has doubled by 1.98 times from 11.8 million in 1962 to 23.44 million in 1987 (in 25 years), while it did not fully double during the periods (1987-2012) and (1999-2024).

From the Table (02), it appears that the first period (1962-1987) largely corresponds to Malthus' theory of population doubling every twenty-five years, while his theory was not realized during the following two periods.

By dividing the overall period into sub-periods of five years each, starting from 1965, we can illustrate the population growth rate of Algeria during each sub-period through Table (03) and Figure (01).

**Table (03) : population growth rate, death rate, birth rate and fertility rate in Algeria
throughout historical periodse**

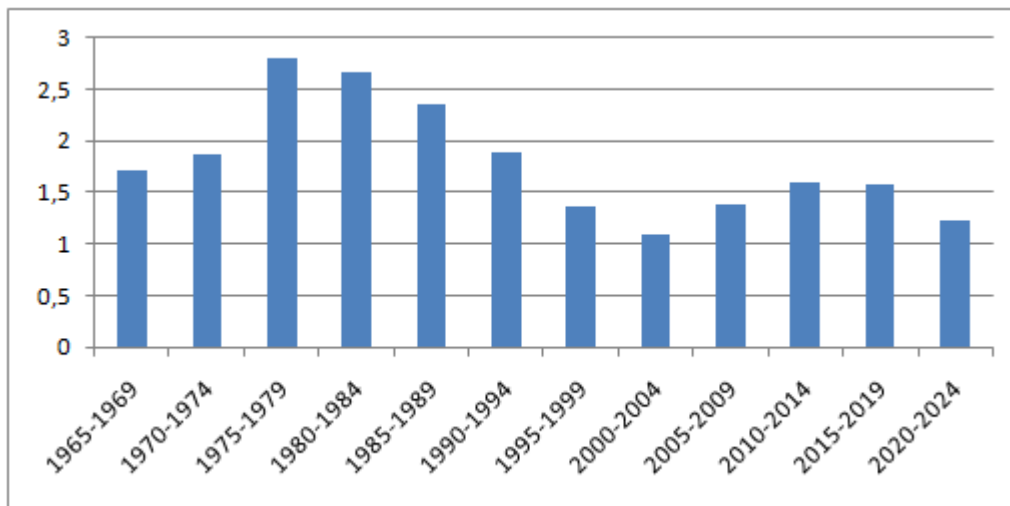
Periods	pop growth rate*	death rate*	birth rate*	Fertility rate**
1965-1969	1,71917054	22,4072	47,1644	7,7106
1970-1974	1,86845697	20,372	20,372	7,6292
1975-1979	2,80219212	16,3342	43,9274	7,3064
1980-1984	2,67685983	10,3052	41,1708	6,6586
1985-1989	2,35151886	6,6436	34,4392	5,3524

1990-1994	1,88748554	5,798	28,8284	4,2278
1995-1999	1,36055735	5,537	21,3412	2,9646
2000-2004	1,08594836	4,9258	19,6052	2,4978
2005-2009	1,38901672	4,7226	22,7862	2,7008
2010-2014	1,60141974	4,6554	25,3118	2,9702
2015-2019	1,57318217	4,66	24,7414	3,0576
2020-2024	1,22086185	5,04775	20,9845	2,84825

*: % ; **: child per women

Source: By the resercher using data from (World Bank Database, 2026)

Figure (01): Population growth rate of Algeria throughout historical periods



Source: By the resercher using data from (World Bank Database, 2026)

Population growth rate in Algeria has been increasing since independence reaching its peak during the period (1975-1979) at an estimated rate of 2.8%. This is due to the high birth rate (43,92 per thousand) and low death rate (16,33 per thousand) during that period, resulting from improved healthcare and high fertility rates (7.3 child per women).

Subsequently, it declined during the 1980s and 1990s. This could be attributed to the deteriorating social conditions in the country due to the economic crisis in the mid-1980s. The population growth reached its lowest point during the period (2000-2004) at an estimated rate of 1.085%. This was accompanied by a significant decrease in fertility rates, from 7 child per woman in the late 1960s and 1970s to approximately 2 child per woman in the late 1990s and the beginning of the 2000s.

The birth rate was very high in the period (1965–1969) reaching 47,16 per thousand , it remained high throughout the 1970s and early 1980s, but it began to decline significantly from the mid-1980s, and reached approximately 21 per thousand in the period (2020–2024).

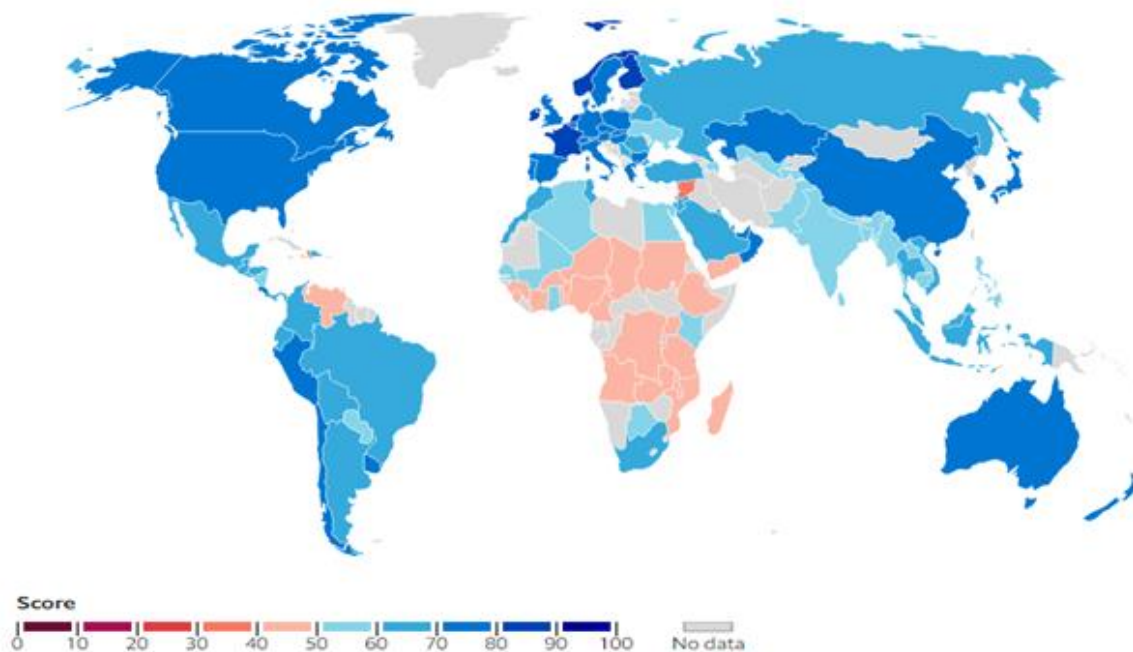
The decline in birth rates and fertility rates in Algeria in recent years can be attributed to the state's family planning policies and encouragement of birth spacing, as well as the rising age of marriage among Algerians compared to previous periods.

3. Food security indicators in Algeria:

Food availability, whether through local production, imports, or subsidies, and individuals' ability to access food; along with a healthy diet (clean water usage, healthcare); and the stability of food availability and access at all times; independence of economic and climatic shocks, all represent the four dimensions of food security. (Food and Agriculture Organization, 2008)

Figure (02) and Table (04) illustrate Algeria's food security indicators and their ranking among other countries.

Figure(02): Global food security index (position of Algeria)



Source: (Economist impact, 2022)

Figure(02) shows a map of the Global Food Security Index, where a scoring scale from 0 to 100 was used to rank countries about their level of food security(considering the four dimensions of food security):

Countries with high food security performance (80–100) are represented in dark blue; Countries with average to good performance (60–79) are represented in light blue; Orange indicates low-performing countries (below 50); Gray color represents countries for which data is unavailable.

Algeria appears in light blue, meaning its score falls within the (60–79) category, indicating that its performance ranges from average to good.

Table(04): Global food security index for Algeria (rank and score)

	Score	Rank (113 countries)
Overall score	58.9	68 th
Affordability	66.8	64 th
Availability	57.3	63 rd
Quality and Safety	54.7	82 th
Sustainability and Adaptation	54.2	56 th

Source: (Economist impact, 2022)

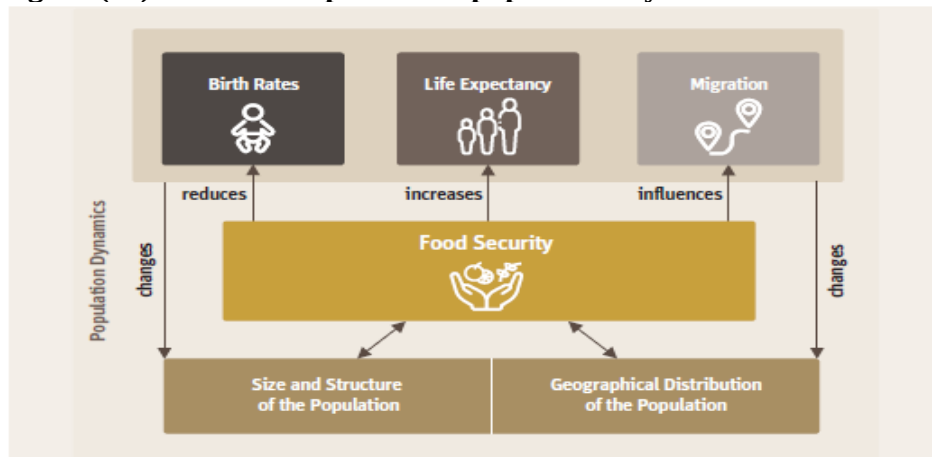
Out of 113 countries, Algeria ranked 68th on the food security index with a score of 58.9. Regarding to sustainability and adaptation (rank 56th / score 54.2), it ranks best compared to other indicators, which reflects Algeria's efforts to adapt to climate change.

To improve its global ranking, Algeria needs to raise the quality and safety of its food (rank 82th / score 54.7), boost local production(rank 63rd / score 57.3), and improve its Affordability (rank 64th / score 66.8) so that the majority of the population can buy food.

4.The relationship between food security and population growth :

Food security is not limited to providing food, it also affects population dynamics. Figure (03) shows relationship between population dynamics and food security .

Figure (03): Relationship between population dynamics and food security

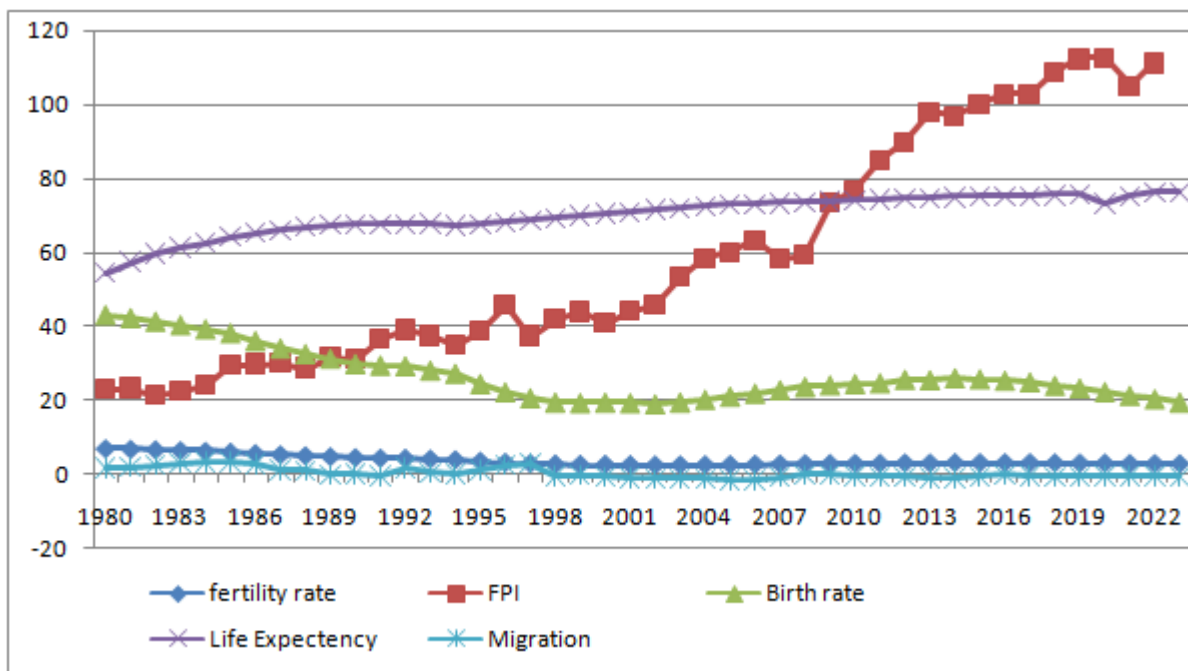


Source : (Berline Institute for population and development, 2024, p. 2)

Food security leads to changes in population size by reducing mortality rates, particularly among children, and increasing life expectancy. Furthermore, it reduces fertility rates and birth rates, thus altering the age structure of the population (children, youth, and the elderly) and its geographical distribution (emigration, urbanization, and ruralization), because providing food in living areas does not force people to migrate (internally or internationally). (Berline Institute for population and development, 2024, p. 2)

Using Algerian data on food security, represented by the food production index, and population components (birth rate, fertility rate, life expectancy, and emigration rates) during the period 1980-2023, we illustrate the relationship between population and food security in the figure (04).

Figure(04):Relationship between population and food security in Algeria (1980-2023)



Source : By the resercher using data from (World Bank Database, 2026)

from the figure, we observe that the rise in the food security index (from less than 23 in 1980 to more than 111 in 2023), represented by the food production index, was accompanied by a decrease in emigration rates. It also contributed to an increase in life expectancy at birth from less than 55 years in 1980 to more than 76 years in 2023. In addition, we note a significant decrease in fertility rates from 7 children per woman in 1980 to 2 children per woman in 2023, accompanied by a decrease in the birth rate from approximately 43 per thousand in 1980 to less than 20 per thousand in 2023. (World Bank Database, 2026)

III. METHOD AND PROCEDURES:

1. Data and methodology

To analyze the relationship between food security and population growth we employ a linear regression using ordinary least square on annual data from 1980 to 2024

To translate variable coefficients as elasticities, we will use logarithms of the variables. Based on the study conducted by (Aiyedogbon, Anyanwu, Grace Hezeki, Petrushen, & Zhuravka, 2022) about population and food security in Nigeria , we rely on the following model:

$$\ln FS = \alpha + \beta POPG + \varepsilon_t$$

POPG : Represents the annual population growth rate as an independent variable. (We used the World Bank database of total population to calculate the annual growth rate).

$$POPG = (\ln(POP_t) - \ln(POP_{(t-1)})) * 100$$

t : Represents time (current year) ; t-1 : Represents previous year.

FS: Represents the production quantity of wheat from FAO database as proxy of food security.

ε_t : Represents error term

2. Stationarity test :

To study the stationarity of time series, the Augmented Dickey-Fuller (ADF) test is employed.

Table (05) : Unit root test result

Variables	At Level					
	Constant		Constant & Trend		Without Constant & Trend	
	t_Statistic	Prob.	t_Statistic	Prob.	t_Statistic	Prob.
LFS	-1.510967	0.5184	-7.024631	0.0000	0.601979	0.8425
POPG	-3.140801	0.0312	-3.299149	0.0807*	-2.108678	0.0350
Variables	At First Difference					
	Constant		Constant & Trend		Without Constant & Trend	
	t_Statistic	Prob.	t_Statistic	Prob.	t_Statistic	Prob.
LFS	-8.158586	0.0000	-5.303423	0.0006	-8.158586	0.0000

* : significance level of 10%.

Source : Eviews Output

Table(05) shows that the serie POPG is stationary at the level, while the serie LFS is non-stationary at the level, but it become stationary after the first difference at a significance level of 5%.

LFS is I(1), POPG is I(0) Therefore, there is no cointegration between the two series.

3. Estimation of the model:

Using ordinary least square method, we present the model estimation in table (06)

Table (06): Model estimation

Dependent Variable: LFS				
Method: ARMA Maximum Likelihood (OPG - BHHH)				
Date: 03/17/26 Time: 12:05				
Sample: 1980 2024				
Included observations: 45				
Convergence achieved after 7 iterations				
Coefficient covariance computed using outer product of gradients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.32310	0.439215	34.88750	0.0000
POPGR	-0.433628	0.203338	-2.132550	0.0390
AR(1)	0.329628	0.153949	2.141145	0.0383
SIGMASQ	0.177875	0.045159	3.938841	0.0003
R-squared	0.362527	Mean dependent var	14.39907	
Adjusted R-squared	0.315883	S.D. dependent var	0.534203	
S.E. of regression	0.441847	Akaike info criterion	1.291538	
Sum squared resid	8.004384	Schwarz criterion	1.452130	
Log likelihood	-25.05960	Hannan-Quinn criter.	1.351405	
F-statistic	7.772148	Durbin-Watson stat	2.121442	
Prob(F-statistic)	0.000319			
Inverted AR Roots	.33			

Source : Eviews output

As mentioned in table(06), to correct the problem of serial correlation , the AR(1) process was used .

IV.STUDY RESULTS (ANALYSIS AND DISCUSSION) :

The most important research finding are:

- The population in Algeria has witnessed continuous growth since independence;
- Food security is a right for all people, based on four fundamental dimensions;
- According to the global food security index, Algeria's performance ranges from average to good with a score of 58.9;

- During the period of the study, the rise of the food security index of Algeria was accompanied by a decrease in emigration rates, an increase in life expectancy at birth, a decrease in fertility rates, and a decrease in the birth rates ;
- The econometric study shows a significant inverse relationship between population growth in Algeria and food security, with a coefficient of -0.43 (meaning that an increase in the population growth rate in Algeria by 1% leads to a decrease in food security by 0.43%);
- Food security (represented by wheat production measured in tons) in Algeria is positively affected by the previous year's value, as the AR (1) parameter shows a positive and statistically significant value;
- The Durbin-Watson test value is 2.12, indicating the absence of serial correlation problem;
- The coefficient of determination R square=0.36, meaning the explanatory power of the model is weak if considering only the population growth rate as the explanatory variable;
- This suggests that other variables also influence food security in Algeria;
- Fisher's statistic indicates the overall significance of the model.(Prob=0.000319) at significance level of 5%.

V.CONCLUSION:

Population growth in Algeria negatively impacts food security. Despite declining fertility and birth rates in recent years, the results of the econometric study indicate that wheat production in Algeria (as a proxy of food security) is insufficient to meet domestic needs.

The low coefficient of determination in the econometric model suggests that other factors also affect food security in Algeria and must be considered.

To contribute to achieving food security in Algeria, the growing population must be utilized to engage in agriculture and provide support to those working in this sector. Furthermore, efforts must be made to improve food quality and ensure its availability to the largest possible segment of the population.

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