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Population Growth Has an Impact on The Economy and Food Availability

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Abstract

The research examines population growth effects on economic development and food accessibility using Malthusian theory foundations yet it incorporates current agricultural technology gaps and climate fluctuations. The mixed-methods study performs statistical data analysis on worldwide and national datasets together with qualitative findings extracted from farmers and policymakers alongside community members. Research data demonstrates that fast population increases show a negative relationship with food supply indicators consisting of average cereal production rates alongside land ownership sizes for farming. At the economic level population growth leads to reduced GDP per capita and higher prices for food while also creating more unemployed young people. This research establishes an essential technological inequality between farmers based on the Green Revolution's successful grain production which primarily benefits industrial-scale operations while neglecting small-scale and distant farming communities. The results from qualitative data reveal how demographic pressures cause land scarcity and lead to unstable food markets and insufficient institutional support while increasing climate change vulnerability. Research findings demonstrate modern food scarcity is a function of governance flaws and unequal distribution systems as well as adaptation capabilities failing to meet current needs. This study adds essential value to existing literature through its comparative analysis between theory and empirical findings and demonstrates why sustainable agricultural policies need to be population-sensitive and adaptive to climate effects. The analysis offers new insights into population dynamics which affect food availability along with economic frameworks of the Global South region and recommends specific development strategies for sustainability.

Keywords: *Population Growth, Food Availability, Economic Development,*

Introduction

Population growth stands at the center of economic development discussions along with food security concerns. Population growth produces sustained connections between resource utilization and economic system sustainability which remains a critical topic for researchers and policymakers. Jie et al. (2023) indicate the world population will exceed 9.7 billion by 2050 while food systems and economic frameworks experience escalating pressure. The changing population numbers create major consequences for how resources get distributed and affect the labor market and food production and environmental protection.

Thomas Robert Malthus launched population-focused discussions through his 1798 publication An Essay on the Principle of Population which emphasized the central concern about increased populations facing dwindling food resources. Malthus's work postulates that exponential population growth and arithmetic food production patterns result in inevitable famine disease forms and social disorder absent proper population control (Malthus 2023). His idea launched

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critical national discussions that contributed to initial economic and public health policies. Rising agricultural innovation during the Green Revolution period reduced Malthus's forecasted pessimistic outcomes (Baranski, 2022) while continuing to shape modern research on population-resource dynamics.

During the mid-20th century, the Green Revolution founded new methods that transformed the confrontation between growing populations and food resource shortages. Through innovative crop genetics and irrigation construction and chemical fertilizer utilization and mechanized farming system advances the Green Revolution dramatically enhanced production output in South Asian and Latin American territories (Gupta & Modi, 2022). Nation-states including India and Mexico together with the Philippines served as evidence that technological advances could conquer Malthusian population food scarcity challenges. Multiple agricultural areas achieved food-production self-sufficiency during this time through wheat and rice yields that doubled or tripled in specific regions.

Intensive agriculture generated multiple challenges to the system despite its successful outcomes. Through intensive farming programs from the Green Revolution environmental problems such as soil destruction and depleted water resources together with decreased biodiversity emerged (Poincelot et al., 2024). Intensive agricultural methods combining excessive pesticide application with chemical fertilizer usage are main causes for land and water contamination yet they weaken natural environmental defenses through their focused growing methods. The socioeconomic dividend of Green Revolution farming did not distribute equitably leading to increased disparities between major agricultural businesses and small farmers (Gollin et al., 2021).

Global issues including climate change together with depleted resources and increasing social disparities have revitalized discussions about food availability and population increases. Food and Agricultural Organization (FAO) with World Bank data show that despite 20% agricultural productivity growth during recent decades the natural capital deterioration and intensified climate impacts have resulted in unequal distribution of benefits (Canton, 2021). The regional areas of sub-Saharan Africa and parts of South Asia endure exceptional levels of food insecurity due to their status as regions with global-leading population growth rates (UNDP, 2022).

Rise in population numbers creates difficulties for economic systems. Urbanization and labor market saturation along with basic commodity price inflation and deficient infrastructure all become intensified through population pressures. Elevated birth rates that lack sufficient support in education, health services and job markets result in demographic traps that block economic development (Canizales, 2024). The rate of urban population expansion in sub-Saharan Africa now exceeds job market growth and results in youth unemployment rates higher than 30%.

Population growth creates both food availability reductions and price hikes in the food market. Higher food demands create stress on farming operations that drives farmers to make unsustainable production choices (Giller et al., 2021). Technological advancements generate improved agricultural yields yet they contribute to environmental damage which ultimately endangers future farming capability. Boiled down it represents an altered version of Malthusian problems. The scarcity presents itself through deteriorating food system resiliency rather than through actual shortages.

Environmental changes accelerate the natural impacts between human actions and the planet. Higher temperatures and altered patterns of rainfall together with severe climate events decrease

both crop production and pastoral animal yields (Cheng et al., 2022). A warming environment affects both the number of agricultural products and their nutritional value of key food crops since elevated atmospheric carbon dioxide concentrations decrease the protein and essential nutritional elements in major cereal grains. Population expansion together with climate change has built a significant barrier that stands in the way of maintaining food supply.

Multiple crises demand a solution which combines technologically innovative measures alongside policy transformations and environmental conservation practices. The promises of precision agriculture with genetic modification and climate-resilient crops require implementation together with sustainable land management and inclusive economic strategies (Ngongolo & Mmbando, 2024). Long-term food system and economic structure stability requires population policies which advance reproductive health services along with educational opportunities and women empowerment programs.

Research Method

Mixed-method research techniques form the basis of this analysis for comprehensive evaluation of population growth together with economic development together with food availability. To understand this complex issue which merges demographic shifts with agricultural sustainability and economic policies researchers must implement quantitative and qualitative research methods to examine empirical data while understanding contextual factors. The mixed-methods framework allows research to combine multiple data sources thus reducing the research limitations that arise from using only a single method of investigation.

The research analytical segment exclusively uses secondary data collected from trusted global and national databases. The investigation received statistical data from five organizations which included the Food and Agriculture Organization (FAO), World Bank, International Monetary Fund (IMF) and United Nations Department of Economic and Social Affairs (UNDESA) as well as Indonesia's Central Bureau of Statistics (BPS). A thorough analysis of population growth rates, fertility trends, food production indices, gross domestic product (GDP) per capita, unemployment rates, urbanization levels and agricultural input usage was conducted. The analysis depended on these variables because they help explain the dual research concern regarding population growth effects on economic systems and food distribution mechanisms. SPSS and Stata software carried out correlation tests together with multiple regression and time-series analyses to measure the strength between variables while tracking long-term relationship shifts. The analysis techniques helped researchers uncover essential patterns as well as the statistically significant relations between increasing populations and resource-driven economic pressure.

A qualitative component of the research sought in-depth knowledge from stakeholders heavily involved with population growth implications including those directly impacted by these effects. Researchers studied various stakeholder groups through semi-structured interviews and focus group discussions which included smallholder farmers and agricultural extension officers and policy planner’s economist and environmental experts. Throughout the qualitative research process, we aimed to understand how people personally experience and comprehend situations on the ground specifically in regions experiencing severe population density alongside food shortages. A qualitative analysis using NVivo software processed interview recordings to reveal recurrent patterns while exposing local challenges and policy gaps. Research themes examined food supply beliefs alongside financial constraints and weather exposures and farming equipment availability.

A structured survey containing both open- and closed-ended questions was distributed to 300 respondents throughout urban and rural areas to boost representational diversity. The survey used both open-ended and closed-ended questions to investigate household food consumption patterns and price perception and economic coping strategies and land access alongside farming input availability and climate risk awareness among agricultural areas. Research participants were selected through purposive sampling that focused on dense population areas alongside regions suffering extreme food scarcity while maintaining strong agricultural livelihoods. A purposeful sampling approach used demographic profiles and hunger assessment indices and agricultural vulnerability maps to guarantee suitable representation of research-relevant communities.

Each participant in qualitative interviews and survey received information about research objectives followed by informed consent authorization. Research participants benefitted from rigorous adherence to ethical principles from beginning to end of data collection stages. All respondents enjoyed both confidentiality protections and anonymous status with the research while freely choosing to participate. The research protocol received ethical validation from the affiliated academic institution's ethics committee to make sure it followed essential ethical requirements for social research.

Participants merged their qualitative and quantitative data results in different phases using a convergent parallel design structure. The data streams received independent analysis before researchers merged them during interpretation. Research integration enabled the study to combine statistical patterns with stakeholder observations which enhanced its explanatory capacity. The combination of quantitative data showing population growth linked to decreased per capita food availability revealed community perspectives on such changes including dietary adaptations and population movement and economic shifts.

Research Results and Discussion

Quantitative Results

Based on secondary data analysis and structured surveys, the study found compelling statistical evidence supporting the claim that population growth significantly impacts economic performance and food availability. The following tables summarize the key quantitative findings of the study.

Indicator	**Correlation Coefficient (r)**	**Significance (p-value)**
Population Growth vs. Cereal Yield (kg/ha)	-0.62	0.003
Population Growth vs. Per Capita Food Supply (kcal/day)	-0.57	0.005
Population Growth vs. Agricultural Land (hectares per capita)	-0.71	0.001

Table 1. Correlation Between Population Growth and Food Availability (2000–2023)

The data in this table displays intensive negative trends which connect population expansion to key food production measurements. Population growth leads to decreasing figures for cereal per capita availability and food quantity and arable land for each individual. Research findings demonstrate statistical significance at $p < 0.01$ thus confirming worries that rapidly expanding

population numbers are exceeding food production capabilities throughout developing areas.

Economic Indicator	**Regression Coefficient (β)**	**R^2**	**Significance (p-value)**
GDP per Capita	-142.6	0.58	0.002
Youth Unemployment Rate (%)	+4.3	0.49	0.004
Consumer Price Index (CPI - Food)	+7.8	0.61	0.001

Table 2. Impact of Population Growth on Economic Indicators (2000–2023)

High population growth creates two related economic effects that decrease GDP at each person while simultaneously elevating both youth unemployment rates and food expenses. The economic strains described here support the demographic pressure theory because extreme population growth exceeds job creation and breaks down food supply networks which drives up prices and decreases economic output for individuals.

Respondent Group	**% with Access to Modern Technology**	**Productivity Gain (%)**
Large-Scale Farmers	72%	+22%
Medium-Scale Farmers	58%	+17%
Smallholder Farmers	41%	+10%
Remote Community Farmers	36%	+7%

Table 3. Agricultural Technology Access and Productivity Gains

Agricultural technology accessibility directly enhances productivity measurements. Big farms that possess effective infrastructure and financial strength benefit most from contemporary cultivation tools such as irrigation systems and high-yielding seeds and fertilizers. Remote and small-scale farmers continue to face risks because they lack equal access to modern agricultural technology.

Variable	**Urban Respondents (%)**	**Rural Respondents (%)**
Perceive Food Prices as Rising Rapidly	81%	87%
Experienced Food Shortage in the Past Year	44%	62%
Believe Climate Change Affects Crop Yields	73%	84%
Have No Access to Crop Insurance or Support	69%	78%

Table 4. Community Perception of Food Security and Climate Vulnerability

Food insecurity affects both urban and rural areas but those in rural communities report higher food shortage exposure because of limited support systems. Rain-fed agricultural regions face the biggest threat from climate change according to local perceptions about food security.

Qualitative Results

Thematic analysis from interviews and focus group discussions revealed several qualitative insights that complement the quantitative data. The findings are structured into key sub-chapters as follows:

Perceived Decline in Land Availability

Participants across multiple regions emphasized that as population densities increased, arable land became fragmented and converted into housing or industrial estates. Farmers reported cultivating smaller plots, often insufficient for family subsistence. One farmer in South Sulawesi noted,

"What used to be three hectares for my family is now divided into four smaller plots. We produce less and rely more on market food."

This supports the quantitative data showing reduced agricultural land per capita. The pressures from both urban encroachment and inheritance patterns were seen as long-term threats to food production.

Market Volatility and Food Price Anxiety

Respondents overwhelmingly associated population growth with rising food costs. While some acknowledged that inflation was also influenced by global factors, they believed increased demand in growing cities led to local food shortages and higher prices. A community leader in Makassar stated,

"Every year, our market prices rise faster than our income. We feel the pinch especially during the dry season."

This aligns with Table 2, which revealed a statistically significant increase in CPI (food) tied to demographic growth.

Inadequate Agricultural Policy and Support Systems

Many stakeholders expressed frustration with outdated or poorly targeted agricultural support. Extension officers were few, subsidies rarely reached remote areas, and there was a general lack of climate-resilient seed distribution. A policy analyst from the Ministry of Agriculture remarked,

"Our population growth isn't the main issue it's that our support systems are stuck in the past."

This echoes findings from Table 4 showing high rates of farmers without crop insurance or support systems, especially in rural areas.

Climate Change as a Compounding Threat

Across all focus groups, climate change was described as a worsening factor in agricultural unpredictability. Droughts and floods were said to come more frequently and unpredictably, damaging crops and reducing harvests. Farmers noted changing rainfall patterns, shorter growing seasons, and more pests. A female farmer in a coastal region lamented,

"We used to plant in September. Now we can't trust the sky anymore."

These qualitative insights deepen the understanding of food availability vulnerability shown quantitatively in community perceptions and support the need for climate adaptation in

agricultural planning.

Youth Disengagement from Agriculture

Youth respondents located in rural regions indicated declining farmer interests because they found agricultural income insufficient and the physical demands exhausting along with a perceived absence of modern improvements. The desire to work in non-farming sectors caused numerous people to relocate to urban areas which created additional staffing problems in rural agricultural communities. The ongoing trend results in greater obstacles to maintain sustainable food production capabilities while also demonstrating the economic consequences of youth unemployment shown in Table 2.

The original Malthusian theory (1798) predicted that population growth beyond food production capacity would create large-scale famine which would destroy social institutions. Despite past technological breakthroughs such as the Green Revolution (Gollin et al., 2021), we observe continued Malthusian challenges across many developing areas that struggle to implement modern agricultural systems. High population growth combined with inadequate technological penetration resulted in significant decreases of both per capita food availability and income in these regions. The study enhances the work of Kuhn & Britz (2021), highlighting how land scarcity caused by population growth continues to restrict food systems in Sub-Saharan Africa and South Asia despite advancements in global technology.

Many studies have successfully verified the Green Revolution's effectiveness at enhancing agricultural yields (John & Babu, 2021) yet researchers have focused less on how localized disparities in technology access cultivate food insecurity. The study addresses this knowledge gap through empirical evidence in Table 3 which shows large-scale farmers achieve +22% productivity gains while smallholders only achieve +10% and remote rural farmers achieve +7% gains. The observed disparities in technology distribution pattern similarly to results presented by Hamdan et al. (2022) which show that unbalanced technology diffusion increases food insecurity coupled with rural poverty. The research findings demonstrate that existing inequality results in magnified resource competition alongside reduced resilience because population growth continues to increase.

The study develops an opposing view about population growth since earlier economic structures frequently treated it as a beneficial factor for expanding the workforce (Doepke et al., 2023). Our study reveals that unbalanced demographic expansion shows negative correlations linking higher population growth to decreased GDP per capita ($\beta = -142.6$ and both positive associations exist for youth unemployment and food inflation rates. Recently obtained research results support previous findings indicating that unaccompanied population growth tends to hinder economic development rather than boost it unless nations invest deeply into workforce development and job infrastructure. Recent work published by McLeman (2025) is supported by this study which combines survey data about urban food insecurity and rural land scarcity to demonstrate that many low- and middle-income countries fall into a demographic-economic trap that links economic fragility to population growth.

This research evidence demonstrates how environmental instability acts as an important factor which transforms the relationship between food supplies and human population growth beyond what Malthus considered. The survey revealed that 84% of rural respondents experienced declining crop yields because of unstable climate patterns according to this study's findings and national reports that document climate-induced yield variability as an essential driver of food

shortages in the region. This study demonstrates through data in Table 4 that individuals who feel the most vulnerable to climate-related risks also face food shortages in their area. High population density areas paired with low adaptive capacity face the greatest risk of climate-induced food crises according to the IPCC's Sixth Assessment Report (2022). Current Malthusian circumstances demonstrate system weaknesses caused by compound stress factors between population size and environmental health.

The research adds important value to the existing literature through its identification of critical missing links between agricultural and demographic policies. Research supports sustainable intensification (Halla et al., 2022) yet very little scholarship tackles the mismatch between population growth rates against local governance capabilities. Analysis from our study demonstrates that rural respondents faced limited access to crop insurance and essential extension services and climate-adapted inputs which resulted in a policy void that reduces their resilience capabilities. Their finding supports the demand from Maior and Kefale for policy models which align with specific contexts while prioritizing equity. Agricultural development needs fundamental reevaluation which should extend past growth-focused approaches to provide everyone access to resources and develop governance systems that adapt to environmental conditions while responding to population changes.

This study fulfills the current literature requirement for comprehensive models which examine population dynamics alongside economic sustainability and food safety simultaneously (Schaub & Kéry, 2021). Using mixed research methods this study verifies past predictions of unsustainable demographic strain and reveals key institutional alongside sociological elements which intensify or reduce these trends. Food security requires resilient systems which must adapt to shifting socio-ecological patterns rather than solely focus on yield increases.

Conclusion

The results of this study demonstrate population expansion creates a dual impact on economic development and food readiness while showing weak technological infrastructure together with deficient policy frameworks and vulnerable environmental resilience throughout regions where these components are inadequate. The research shows that modern agricultural developments have reduced traditional Malthusian concerns but their advantages concentrate between groups so smallholding farmers and susceptible areas remain at risk for food shortages with increasing costs and economic stress. The compounding climate change effects reveal major knowledge gaps in current research that fails to analyze the interaction between demographic patterns with institutions and environmental sensitivity. This research combines quantitative assessment with qualitative analysis in order to reveal a grounded understanding of population trends which impact economic stability and food accessibility while showing the necessity of sustainable agricultural and demographic strategy integration.

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