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Food Self-Sufficiency and Economic Growth in Southern Sumatra: An Empirical Analysis Using the Difference-in-Differences Method

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Abstract
This study examines the impact of the *Gerakan Sumsel Mandiri Pangan* (GSMP) program on regional economic growth in Southern Sumatra using a Difference-in-Differences (DiD) approach. GSMP is a flagship provincial program aimed at strengthening household food self-sufficiency and reducing dependence on social assistance. The analysis compares economic growth trends between South Sumatra Province as the treatment group and Lampung Province as the control group over the period 2019–2024. The DiD results indicate that, following the implementation of GSMP, the average growth of Gross Regional Domestic Product (GRDP) in the treatment province increased by approximately 0.024 percentage points relative to the control province. Further regression results show that food security, proxied by the Food Security Index, has a positive and statistically significant effect on GRDP, while population density exerts a negative influence. These findings imply that while GSMP contributes to improved food self-sufficiency and exhibits a positive association with economic growth, its aggregate impact on regional GRDP has not yet been sufficiently strong to generate statistically significant macroeconomic effects.
Keywords: Difference-in-Differences, Food Self-Sufficiency, GSMP, Regional Economic Growth, Southern Sumatra

Abstrak
Penelitian ini mengkaji dampak program Gerakan Sumsel Mandiri Pangan (GSMP) terhadap pertumbuhan ekonomi regional di Sumatera bagian Selatan dengan menggunakan pendekatan *Difference-in-Differences* (DiD). GSMP merupakan program unggulan pemerintah provinsi yang bertujuan untuk memperkuat kemandirian pangan rumah tangga serta mengurangi ketergantungan terhadap bantuan sosial. Analisis ini membandingkan tren pertumbuhan ekonomi antara Provinsi Sumatera Selatan sebagai kelompok perlakuan dan Provinsi Lampung sebagai kelompok kontrol selama periode 2019–2024. Hasil estimasi DiD menunjukkan bahwa setelah implementasi GSMP, rata-rata pertumbuhan Produk Domestik Regional Bruto (PDRB) di provinsi perlakuan meningkat sekitar 0,024 poin persentase dibandingkan dengan provinsi kontrol. Hasil regresi lanjutan menunjukkan bahwa ketahanan pangan, yang diproksikan dengan Indeks Ketahanan Pangan, berpengaruh positif dan signifikan secara statistik terhadap PDRB, sementara kepadatan penduduk memberikan pengaruh negatif. Temuan ini mengimplikasikan bahwa meskipun GSMP berkontribusi dalam meningkatkan kemandirian pangan dan menunjukkan hubungan positif dengan pertumbuhan ekonomi, dampak agregatnya terhadap PDRB regional belum cukup kuat untuk menghasilkan efek makroekonomi yang signifikan secara statistik.
Kata Kunci: *Difference-in-Differences,* GSMP, Kemandirian Pangan, Pertumbuhan Ekonomi Regional, Sumatera bagian Selatan

INTRODUCTION

Regional economic growth is one of the main indicators of development success. Increases in production capacity, community self-reliance, and the strengthening of the food sector make a significant contribution to regional competitiveness. At the macro level, the economy of South Sumatra has shown post-pandemic recovery, with economic growth reaching 5.03% in 2024 and Gross Regional Domestic Product (GRDP) at current prices amounting to approximately IDR 663.96 trillion (BPS of South Sumatra Province, 2025). Nevertheless, the agriculture, forestry, and fisheries sector experienced a contraction, indicating structural challenges in local-scale food production capacity (BPS of South Sumatra Province, 2025). The poverty rate in South Sumatra Province in March 2024 was recorded at 10.97%, with a per capita poverty line of IDR 554,197 per month, where food expenditures constituted a substantial proportion of the basic needs basket (BPS South Sumatra, 2024). In this context, programs targeting household food self-sufficiency—such as the *Gerakan Sumsel Mandiri Pangan* (GSMP), which aims to reach 81,000 poor households—have strong policy relevance (Antara News South Sumatra, 2021).

The Government of South Sumatra Province launched the *Gerakan Sumsel Mandiri Pangan* (GSMP) as a flagship program aimed at reducing community dependence on social assistance by promoting household-level food self-sufficiency. GSMP was simultaneously introduced across 17 regencies and municipalities in South Sumatra in December 2021 as part of the provincial strategy to strengthen household food security (Litbangda South Sumatra, 2021). GSMP focuses on the utilization of household yards, diversification of food sources, and improving community access to food-based income opportunities. The program interventions include the distribution of vegetable and fruit seedlings, improved chicken breeds (*Kampung Unggul Balitbangtan*), catfish farming, feed and cages, as well as technical assistance provided by agricultural extension officers and local institutions such as the Family Welfare Movement (PKK) and bank-supported corporate social responsibility (CSR) programs (Litbangda South Sumatra, 2021). The program specifically targets poor households, with coverage in several regencies including Lahat (9,450 households), East OKU (7,800 households), and Banyuasin (7,625 households) (Antara News South Sumatra, 2021). Through this program, households are expected not only to meet their food needs independently but also to increase income and overall welfare. In the early stages of implementation, approximately 2,031 poor households were reported to have directly benefited from the program (Antara News South Sumatra, 2021). In the long term, the success of GSMP is projected to contribute to regional economic growth.

Despite being implemented for several years, empirical evidence regarding the impact of GSMP on regional economic growth remains limited. Initial reported outcomes suggest several positive effects: food inflation in South Sumatra has begun to stabilize through local production of commodities such as chili, shallots, and vegetables cultivated in household yards and previously unproductive land (Suara South Sumatra, 2025). The poverty rate, which had previously been around 12%, reportedly declined to approximately 11.9% in 2022. Furthermore, economic growth has gradually recovered following the pandemic-induced contraction, accompanied by an upward trend in GRDP per capita (Antara News South Sumatra, 2022).

Household-level food self-sufficiency constitutes an important foundation for regional economic stability, as it reduces vulnerability to external shocks and enhances community

productivity. The *Gerakan Sumsel Mandiri Pangan* (GSMP) program represents a food-based development policy aimed at reducing dependence on social assistance by utilizing local resources. Accordingly, GSMP plays a dual role: strengthening food security while simultaneously supporting economic growth through increased household income.

Sari and Putra (2019) find that food self-sufficiency programs reduce the vulnerability of poor households in Central Java, while Handayani (2020) reports an increase in household income from home-garden farming activities following program interventions. In addition, the literature examining the implications of public policy for macroeconomic indicators such as regional economic growth remains relatively limited. However, these studies are predominantly conducted at the micro or household level, limiting their ability to explain whether such improvements translate into broader regional economic outcomes.

Ridhwan and Hartono (2019) employ a Difference-in-Differences (DiD) approach to assess the impact of village funds on local economic development and find positive effects on several public service indicators and village economic activities. Similarly, Wibowo and Yusuf (2021) apply DiD to evaluate social assistance programs in Indonesia and identify a significant reduction in poverty among beneficiary groups. Moreover, these studies are often situated in Java-centric contexts, where infrastructure and market access differ substantially from provinces in Southern Sumatra. As a result, existing literature provides limited insights into the macroeconomic implications of region-specific food security programs implemented outside Java.

From the perspective of program evaluation methods, quasi-experimental approaches such as Difference-in-Differences (DiD) and Synthetic Control have become the primary tools for identifying causal effects (Abadie et al., 2010; Imbens & Wooldridge, 2009). Fitriani (2021) applies DiD to measure the impact of social assistance programs on household consumption expenditure, providing an analytically relevant framework for assessing the effects of GSMP on district-level economic growth. Several sectoral studies emphasize the relationship between agriculture and economic growth. Fan and Brzeska (2016) and Timmer (2002) highlight the role of agriculture in ensuring food security and promoting economic development when supported by market access and infrastructure investment. These studies suggest that the impact of household-level food programs on regional economic growth is highly contingent upon complementary conditions such as market access, infrastructure, and economic integration.

Despite the growing importance of food self-sufficiency programs in Indonesia's regional development agenda, the absence of rigorous macro-level impact evaluation poses a significant policy risk. Without empirical evidence linking household food programs to regional economic growth, policymakers may continue to allocate substantial public resources to interventions whose aggregate economic benefits remain uncertain.

Based on the literature review, several research gaps motivate this study: (1) the limited number of studies that directly link household food self-sufficiency programs to macroeconomic indicators such as GRDP growth; (2) the lack of empirical evidence on the effectiveness of GSMP specifically in South Sumatra; and (3) the need for studies employing DiD methods that control for regional fixed effects and time trends to strengthen causal inference. Therefore, this study is important in providing a data-driven evaluation of the

impact of the GSMP program on regional economic growth, as well as identifying other factors that contribute to economic growth in Southern Sumatra.

This study offers several contributions to the existing literature. First, methodologically, this study applies a Difference-in-Differences approach to evaluate a regional food policy program, contributing to the limited body of impact evaluations of food security interventions at the provincial level in Indonesia. Second, from a policy perspective, the findings provide evidence-based lessons for subnational governments regarding the conditions under which food self-sufficiency programs can support economic growth, offering valuable insights for the replication and adaptation of similar programs in other provinces.

METHODOLOGY

This study employs a quantitative approach using the Difference-in-Differences (DiD) method. This approach is selected for its ability to identify the causal impact of a program or policy by comparing changes in economic indicators between the treatment group and the control group before and after the implementation of the GSMP program. The study is conducted in Southern Sumatra, focusing on South Sumatra Province as the GSMP recipient province and Lampung Province as the non-recipient (control) province. The analysis covers the period from 2019 to 2024, encompassing several years before and after the implementation of the GSMP program. The data used in this study consist of secondary panel data obtained from Statistics Indonesia (BPS), the National Food Security Agency, and the National Waste Management Information System (SIPSN).

Lampung Province is selected as the control group due to its structural and economic comparability with South Sumatra. Both provinces are located in Southern Sumatra and share similar economic characteristics, including a strong reliance on the agricultural sector, comparable population structures, and exposure to similar macroeconomic shocks. Importantly, during the study period, Lampung did not implement a province-wide food self-sufficiency program equivalent to GSMP.

Public policy evaluation requires a quantitative approach to identify causal effects. The Difference-in-Differences (DiD) method is employed to compare changes before and after a policy intervention between the treated group and the untreated (control) group. In this study, impact estimation is conducted using the DiD approach by comparing post-treatment outcome changes between the treatment population and the control population (Gertler et al., 2016).

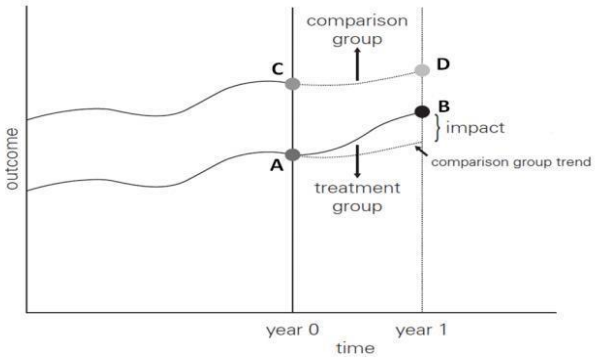

Figure 1.
Difference-in-Differences
Source: Gertler et al., (2016)

Figure 1 illustrates the Difference-in-Differences (DiD) framework, where the baseline period is denoted as year 0 and the post-intervention period as year 1. The treatment group consists of provinces in Sumatra that implemented the *Mandiri Pangan* (GSMP) program, namely South Sumatra Province, while the control (comparison) group comprises provinces that did not implement the GSMP program, represented by Lampung Province. Points A and B denote the outcome variable for the treatment group before and after the intervention, respectively, whereas points C and D represent the corresponding outcomes for the comparison group following the implementation of the GSMP program.

In this study, the design differs from a true (randomized) experiment, in which treatment and comparison (control) groups are determined through a clear and random assignment mechanism. In a natural experiment setting, the treatment and control groups are formed as a result of specific policy changes implemented in a particular region. To address systematic differences between the treatment and comparison (control) groups, at least two periods of data are required: one period before the policy intervention and one period after the policy has been implemented (Imbens & Wooldridge, 2009; Gertler et al., 2016).

The groups are divided into four categories: the control group before the policy change, the control group after the policy change, the treatment group before the policy change, and the treatment group after the policy change. Formally, the Difference-in-Differences (DiD) model is specified as follows:

$$GRDP_{it} = \alpha + \beta_1 GSMP_i + \beta_2 Post_t + \beta_3 (GSMP_i \times Post_t) + \gamma X_{it} + \varepsilon_{it}$$

where $GRDP_{it}$ denotes the Gross Regional Domestic Product of province *i* in year *t*. $GSMP_i$ is a dummy variable equal to 1 for provinces implementing the GSMP program and 0 otherwise. $Post_t$ is a time dummy equal to 1 for the post-implementation period (2022–2024) and 0 for the pre-implementation period (2019–2021). The interaction term $GSMP_i \times Post_t$ captures the causal impact of the GSMP program on regional economic growth. X_{it} represents a vector of control variables (Food Security Index (IKP), Food Waste, and Population Density), and ε_{it} is the error term.

The data used in this study are obtained from official government sources. Regional economic growth, proxied by Gross Regional Domestic Product (GRDP) is sourced from Statistics Indonesia (BPS). The Food Security Index (IKP) is obtained from the National Food Security Agency. Data on food waste are sourced from the National Waste Management Information System (SIPSN), which provides annual provincial-level records of food waste generation. Population density data are obtained from BPS publications.

DISCUSSION AND FINDINGS

The estimation in the Difference-in-Differences (DiD) method presents graphical analysis results that are used to examine the parallel trends between the treatment and control groups before and after the implementation of the program.

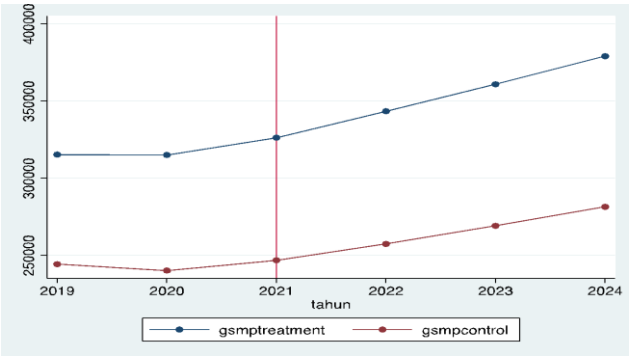

Figure 2.
GRDP Growth Trends: Treatment versus Control Groups
Source: Data processed (2025)

Figure 2 illustrates the Difference-in-Differences (DiD) framework, where year 0 (2019, 2020, and 2021) is considered the baseline period and year 1 (2022, 2023, and 2024) represents the period during which the GSMP program was implemented. The treatment group consists of South Sumatra Province, while the control group is Lampung Province. The figure demonstrates that the parallel trends assumption is satisfied, indicating that the control province shares similar characteristics with the treatment group prior to the intervention.

This implies that, in the absence of differential treatment (i.e., without the GSMP program), both the treatment and control groups would have followed the same linear trend. Under this assumption, the DiD method can appropriately estimate the magnitude of the GSMP program's impact on provincial GRDP.

Based on the Difference-in-Differences (DiD) estimation conducted to assess the impact of the GSMP program on economic growth, the following results are obtained:

Table 1.
Impact Evaluation of the GSMP Program on GRDP

Model	PDRB		
	Before (2019-2021)	After (2022-2024)	After - Before
Province (GSMP)	8,068	8,191	8,191 - 8,068 = 0,123
Province (No GSMP)	7,799	7,898	7,898 - 7,799 = 0,099
Differences (T-C)	8,068 - 7,799 = 0,269***	8,191 - 7,898 = 0,293***	0,123 - 0,099 = **0,024** 0,293 - 0,269 = **0,024**

Source: Data processed (2025)
***significance level 1%; **significance level 5%; *significance level 10%

Table 1 shows that provinces without the GSMP program recorded an average GRDP growth rate of 7.799 percent before the implementation of the GSMP program and 7.898 percent after the program period. The implementation of the GSMP program is associated with an increase of 0.099 percentage points in the average GRDP growth of provinces that did not directly receive the GSMP program. The DiD results indicate that the average GRDP growth rate in provinces implementing the GSMP program is higher by 0.024 percentage points compared to provinces without the GSMP program.

Table 2.
Multiple Regression Results

Dependent: GRDP **Independent**	**Coefficient** **(Std. Error)**
GSMP	-239006.8
	(192812.8)
Time	37625.0**
	(16256.1)
GSMP_Time	249.6
	(27149.9)
IKP	6941.8***
	(1630.8)
Food Waste	-90.05
	(2188.1)
Population Density	-2207.8**
	(1059.3)
_cons	285971.9***
	(73436.6)

Source: Data processed (2025)
***significance level 1%; **significance level 5%; *significance level 10%

Based on the estimation results presented in Table 2, the empirical regression model can be expressed as follows:

$$GRDP_{it} = 285{,}971.9 - 239{,}006.8\, GSMP_i + 37{,}625.0\, Time_t + 249.6(GSMP_i \times Time_t) + 6{,}941.8\, IKP_{it} - 90.05\, FoodWaste_{it} - 2{,}207.8\, PopDensity_{it} + \varepsilon_{it}$$

The time variable has a positive and statistically significant effect on GRDP at the 5% significance level (p-value = 0.021). The estimated coefficient of 37.625 indicates that a one-unit increase in time (year) is associated with an increase in GRDP of 37.625 billion rupiah. This finding confirms the presence of an upward economic growth trend over time. According to Barro (1991), economic growth in a region tends to follow patterns of capital accumulation, knowledge accumulation, and technological diffusion over time. Therefore, this result is consistent with the literature suggesting that temporal progression is positively correlated with increases in economic output.

The Food Security Index (IKP) variable has a positive and statistically significant effect on GRDP (p-value = 0.000). The estimated coefficient of 6.942 indicates that a one-point increase in the food security index is associated with an increase in GRDP of 6.942 billion rupiah. This result is consistent with the theory that adequate and affordable food availability improves health, labor productivity, and socio-economic stability (Timmer, 2004). This finding is further supported by Nugroho and Widyastuti (2020), who show that improvements in food security in rural areas contribute positively to community productivity and local economic growth. Therefore, food security can be viewed as a fundamental pillar of sustainable economic development.

The population density variable has a negative and statistically significant effect on GRDP (p-value = 0.037). The estimated coefficient of −2.208 indicates that higher population density in a region is associated with a reduction in GRDP of 2.208 billion rupiah. This finding suggests that excessive population density may impose pressure on infrastructure, food distribution systems, and employment availability, thereby reducing economic productivity. Todaro and Smith (2015) argue that high population density in regions with limited resources can generate diseconomies of scale in economic development. A similar result is reported by Sukmawati (2019), who finds that population growth not accompanied by adequate employment opportunities and

infrastructure tends to constrain regional economic growth.

Other variables, including GSMP, Food Waste, and the GSMP × Time interaction term, are not statistically significant in the model. The coefficient signs indicate that GSMP and Food Waste tend to have negative effects, while the GSMP × Time interaction shows a positive direction; however, none of these effects are statistically significant with respect to GRDP. This finding suggests that, within the study period and geographic scope, GSMP-related policies and food waste conditions have not yet generated a sufficiently strong impact to influence GRDP. According to FAO (2019), food waste tends to exert a measurable effect on macroeconomic indicators only when losses reach a substantial scale and significantly disrupt the food supply chain.

This finding implies that while GSMP may contribute to improvements in household-level food self-sufficiency, its aggregate effect on provincial GRDP may require a longer adjustment period or stronger complementary conditions—such as infrastructure development and market integration—to become statistically detectable at the macro level.

Overall, the results indicate that time trends (economic growth dynamics), food security, and population density are the primary determinants influencing variations in GRDP. Food security is shown to enhance economic growth, whereas higher population density tends to hinder it. These findings are consistent with development literature emphasizing the importance of food stability and population management in supporting sustainable economic growth.

Thus, the findings of this study provide empirical evidence consistent with economic theory and previous research, indicating that the GSMP program contributes to improved food self-sufficiency, which in turn supports regional economic growth. This finding aligns with endogenous growth theory (Romer, 1990), which emphasizes the importance of local innovation and human capital in driving economic development. The results are also consistent with Handayani (2020), who finds that household food programs enhance community welfare. However, the impact of GSMP is not uniform across regions, as areas with better infrastructure and market access tend to experience greater benefits.

CONCLUSION

This study evaluates the impact of the *Gerakan Sumsel Mandiri Pangan* (GSMP) program on regional economic growth in Southern Sumatra using a Difference-in-Differences (DiD) approach. By comparing South Sumatra as the treatment province and Lampung as the control province over the period 2019–2024, the analysis provides empirical evidence on the macroeconomic implications of a household-based food self-sufficiency policy. The descriptive DiD results indicate a positive differential in Gross Regional Domestic Product (GRDP) growth following the implementation of GSMP. However, regression results show that the interaction term capturing the causal impact of GSMP is not statistically significant, suggesting that the short-term aggregate effect of the program on regional economic growth remains limited within the observed time horizon.

Despite this limitation, the findings yield several important research contributions. From a theoretical perspective, this study contributes to the literature by empirically examining the linkage between micro-level food self-sufficiency initiatives and macro-level economic outcomes, thereby extending food security analysis beyond household welfare and

consumption effects. From a methodological perspective, the application of a Difference-in-Differences framework to evaluate a provincial food policy program adds to the relatively limited body of impact evaluation on regional food security interventions in Indonesia. From a policy perspective, the results provide evidence-based insights for subnational governments, indicating that food self-sufficiency programs such as GSMP may require complementary policies—particularly in infrastructure development, market access, and institutional support—to generate measurable macroeconomic impacts.

This study is subject to several limitations related to data availability and research design. First, the analysis relies on a small number of macro-level observations at the provincial level, which may limit statistical power and contribute to a high goodness-of-fit in the regression model. Second, the use of a single control province, although justified by structural similarity and parallel trends, may not fully capture counterfactual dynamics that could arise from broader regional heterogeneity. Third, the study focuses on short- to medium-term effects following program implementation, which may be insufficient to detect the longer-term economic impacts of food self-sufficiency policies that operate through gradual productivity and income channels.

These limitations highlight important directions for future research. Further studies could expand the analysis by incorporating additional control regions or employing alternative counterfactual approaches. Future research may also benefit from using more granular data at the district or household level to better capture transmission mechanisms between food security improvements and economic growth. Moreover, extending the observation period would allow researchers to assess the long-term growth effects of GSMP and similar programs. Such efforts are essential to inform evidence-based policy design and to ensure that food self-sufficiency initiatives contribute effectively to sustainable regional economic development.

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