

The Role of the GAP Program (*Good Agricultural Practices*) on Corn Farmers' Income in Tilongkabila District

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Abstract

Indonesia, as an agrarian country, has great potential in the development of maize as an important commodity for food, animal feed, and industrial raw materials. However, increasing productivity in various regions still faces several challenges, including land degradation, climate change, and pest and disease attacks. To address these issues, the government has introduced Good Agricultural Practices (GAP) as guidelines for sustainable cultivation aimed at improving productivity and farmers' income. This study aims to analyze the role of the GAP program in increasing the income of maize farmers in Tilongkabila District, Bone Bolango Regency. The research employed a quantitative approach using a survey method. The sample was selected purposively and consisted of 30 maize farmers who had implemented GAP for more than one planting season. Data were collected through observation, questionnaire-based interviews, and documentation, and were analyzed using a Likert scale to assess the role of GAP in terms of production, cost efficiency, and the quality and selling price of harvested maize. The results indicate that the GAP program plays a very significant role in increasing production yields with a score of 83.3%, contributes to production cost efficiency at 79.5%, and has a very strong role in improving product quality and selling prices with a score of 82.4%. These findings demonstrate that the implementation of GAP provides a tangible contribution to increasing maize farmers' income through higher productivity, cost savings, and improved crop quality.

Keywords: *Good Agricultural Practices (GAP); Farmers' Income; Corn Productivity.*

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INTRODUCTION

Indonesia is an agricultural country with abundant natural resource potential. Its tropical climate and high soil fertility make the agricultural sector a major driver of economic development, a provider of employment, and a source of national food security (Ekayuliana & Hidayati, 2020). Corn is a strategic food crop because it is needed as food, animal feed, and industrial raw material. Based on data from the Central Statistics Agency (2023), national corn production in 2022 reached 19.6 million tons, making it the second largest commodity after rice. Increased domestic corn production also contributes to strengthening food security and reducing dependence on imports (Prasetyo et al., 2024). However, various obstacles such as soil fertility degradation, climate change, and attacks by plant pests still cause fluctuations in corn production in various regions in Indonesia (FAO, 2024).

To address these challenges, the government introduced the concept of *Good Agricultural Practices* (GAP) as a guideline for good, safe, and sustainable cultivation. GAP

emphasizes proper land management, the use of superior seeds, balanced fertilization, integrated pest control, and standardized post-harvest handling (Mohd Ali et al., 2020) . Its implementation was strengthened through Minister of Agriculture Regulation Number 48 of 2006 concerning Guidelines for Good Food Crop Cultivation. Several studies over the past decade have shown that GAP has the potential to increase productivity, cost efficiency, and crop quality. Dai et al., (2024) , for example, found that GAP components such as the use of certified seeds, pest control, and timely harvesting were the easiest practices to adopt and provided tangible benefits for hybrid corn farmers.

Previous research conducted by Palia et al., (2018) in Atinggola District, North Gorontalo Regency, showed that the use of production factors such as superior seeds, fertilization, and pest control significantly impacted the production and income of hybrid corn farmers. These findings confirm that appropriate cultivation practices can improve farming efficiency and positively impact farmer income. The relevance of this research is evident in the GAP principle, which also emphasizes the optimization of production factors through standardized cultivation practices. Thus, previous research supports the assumption that GAP implementation has the potential to play a significant role in increasing farmer income, although the level of implementation may vary across regions.

Gorontalo Province is one of the nation's corn producers. In 2023, the province ranked seventh among Indonesia's largest corn producers, with a total production of 531,780 tons (Central Statistics Agency, 2023) . Within this region, Bone Bolango Regency is one of the regions that relies on the agricultural sector as a driving force for the regional economy (BPS Bone Bolango, 2024) . Tilongkabila District is a potential area, with a total corn production of 7,060 tons in 2024 and a productivity of 5.2 tons per hectare. Despite its good potential, this region still faces fluctuations in harvest yields and irregular cultivation practices.

Agricultural extension workers have introduced the GAP program to corn farmers in Tilongkabila District through group mentoring and outreach activities. Initial observations indicate that some farmers have implemented several GAP components, such as the use of certified seeds, pest control, and timely harvesting. This aligns with findings (Dai et al., 2024) , which stated that these principles are the easiest components of GAP for farmers to implement. However, to date, there is no empirical data clearly illustrating the role of GAP in the income of corn farmers in Tilongkabila District. This lack of information makes it difficult to objectively assess GAP's contribution to improving farmer welfare.

Based on these conditions, this study was conducted to identify the role of the *Good Agricultural Practices* (GAP) program on corn farmer incomes in Tilongkabila District. The results are expected to provide an empirical overview of the extent to which GAP implementation contributes to increasing farmer incomes and serve as a basis for developing agricultural policies in the region.

METHODOLOGY

This research was conducted in Tilongkabila District, Bone Bolango Regency, Gorontalo Province, from February to April 2025. The research location was chosen because there had been no studies specifically examining the role of the *Good Agricultural Practices* (GAP) program on corn farmer incomes in the region. The research used a quantitative survey method. This approach was used to obtain a measurable picture of the role of GAP in corn farming activities.

The research variables consist of one independent variable, namely the role of the GAP program, and one dependent variable, namely the income of corn farmers. The GAP variable is measured through the GAP implementation indicator, while farmer income is measured based on the difference between income and farming costs. The sampling technique uses purposive sampling with the following criteria: (1) farmers have implemented GAP for more than one planting season, (2) are willing to be respondents, and (3) have records of costs and

farming income. A total of 30 farmers from Tunggulo, Butu, and Lonuo Villages were selected as research samples.

Data collection techniques included field observations, interviews using questionnaires, and documentation in the form of reports, official records, and other relevant sources. Primary data was obtained from respondents, while secondary data came from relevant documents and publications. The instrument's validity was tested using product-moment correlation and its reliability using Cronbach's alpha.

The data analysis technique used to measure the role of the GAP program in increasing the income of corn farmers in Tilogkabila District is Likert scale analysis. The Likert scale is a scale used to measure the opinions, perceptions, or attitudes of an individual or group towards an event or phenomenon. In this scale, each answer is given a score of 1-5, namely: Strongly Agree (SS), Agree (S), Disagree (DS), Disagree (TS), and Strongly Disagree (STS). The scores resulting from filling out the questionnaire by respondents were then analyzed using the Likert formula to obtain interpretation values. The interpretation formula according to Rahayu and Shafina, (2022: 156) is as follows:

Total score:

$$S = T \times P_n$$

Information:

S = Total Score

T = Respondent

P_n = Selected Likert score

Maximum and Minimum Scores:

$$S_{max} = T \times P_{max}$$

$$S_{min} = T \times P_{min}$$

Information:

P_{max} = Highest Likert score

P_{min} = Lowest Likert score

T = Number of Respondents

Interpretation Index

$$I = \frac{S}{S_{max}} \times 100\%$$

Information:

I = Index (%)

S = Total Score

Interval:

$$I = \frac{100}{K}$$

Information:

I = Interval

K = Highest Likert Score

So the lowest interval is 0% and the highest is 100% with the following categories:

0% - 19.99% = Very insignificant

Figure 20% - 39.99% = Does not play a role

Figure 40% - 59.99% = Less Influential

Figure 60% - 79.99% = Involved

Figure 80% - 100% = Very influential

RESULTS AND DISCUSSION

1. The Role of the GAP Program in Increasing Production Results

The GAP program can improve farmers' production through several techniques, including the use of quality seeds, good soil cultivation techniques, balanced fertilization

according to plant needs, good irrigation management, and pest and disease control. Implementing this good management will increase the potential for increased crop productivity, which in turn will increase production. Respondents' statements regarding the role of the GAP program in increasing corn farmers' income in Tilongkabila District are shown in the following table:

Table 1. The Role of the GAP Program in Increasing Corn Production in Tilongkabila District

NO	Statement Description		Likert Scale Respondents					Total Score
			5	4	3	2	1	
1	Land preparation before planting increases corn production yields.	Re	7	23	0	0	0	127
		%	23.3	76.7	0	0	0	84.7
2	The use of certified superior seeds increases corn production yields.	Re	13	17	0	0	0	133
		%	43.3	56.7	0	0	0	88.7
3	The planting pattern with 1 seed in 1 planting hole increases corn production yields.	Re	3	24	3	0	0	120
		%	10	80	10	0	0	80
4	Determining the appropriate planting distance increases corn production yields.	Re	4	26	0	0	0	124
		%	13.3	86.7	0	0	0	82.7
5	Planting at the right planting time (weather is favorable) increases corn production yields.	Re	11	19	0	0	0	131
		%	36.7	63.3	0	0	0	87.3
6	Fertilization carried out in a measured manner with the right dosage increases corn production.	Re	13	17	0	0	0	133
		%	43.3	56.7	0	0	0	88.7
7	The use of pesticides with the right type and dosage increases corn production yields.	Re	13	17	0	0	0	133
		%	43.3	56.7	0	0	0	88.7
8	Regular weeding increases corn production yields.	Re	1	25	3	1	0	116
		%	3.33	83.3	10	3.33	0	73.3
9	Pruning unproductive plants increases corn production yields.	Re	2	18	8	2	0	110
		%	6.7	60	26.7	6.7	0	73.3
10	Harvesting at the right time (when the corn is ripe/drying) increases corn production yields.	Re	2	28	0	0	0	122
		%	6.7	93.3	0	0	0	81.3
Total		Re	69	212	14	3	0	1249
		%	23.0	70.7	4.7	1.0	0	83.3

Based on Table 1, it is known that there are 10 (ten) statement items in the indicator of the role of the GAP program in increasing corn production. The number of respondents was 30 people, so the maximum score for each statement is 150. The statement items with the highest scores were statements regarding the use of certified superior seeds, measured fertilization, and the use of pesticides of the correct type and dosage, each receiving 133 or approximately 88.7%. This indicates that farmers consider these three aspects as the technical factors that contribute most to increasing productivity because they directly influence plant growth and health. Conversely, the items with the lowest scores were weeding and pruning unproductive plants, receiving 116 or 73.3% and 110 or 73.3%, respectively, indicating that these maintenance practices have not been implemented optimally. Labor constraints, time, and cost-benefit considerations are factors influencing the low farmer involvement in these two activities.

The results of the overall respondent statements obtained a total and percentage score of 1249 or approximately 83.3% and fall into the Very Influential category. This category

indicates that the *Good Agricultural Practices* (GAP) program has a strong role in increasing corn production yields. Technical indicators including land preparation, use of certified seeds, measured fertilization, appropriate pest control, determining plant spacing, scheduling planting times, and timely harvesting received relatively high scores, indicating that these aspects are considered to contribute directly to productivity. In contrast, maintenance activities, particularly weeding and removal of unproductive plants, received lower scores, indicating implementation constraints in the field such as limited labor and cost-benefit considerations.

2. The Role of GAP Programs in Production Cost Efficiency

Production cost efficiency is a crucial dimension in assessing the success of agricultural interventions because it directly relates to the economic viability of farming. Conceptually, production cost efficiency refers to a farmer's ability to produce maximum output with minimal input use (costs), or to produce the same output at a lower cost through more effective input management. Respondents' statements regarding the Production Cost Efficiency indicator for increasing corn farmer income in Tilongkabila District are summarized in the following table:

Table 2. The Role of the GAP Program in Production Cost Efficiency

NO	Statement Description		Likert Scale					Total Score
			Respondents					
			5	4	3	2	1	
1	Perfect land cultivation reduces labor costs	Re	1	18	10	1	0	109
		%	3.33	60	33.3	3.33	0	72.7
2	The use of superior, disease-resistant seeds reduces pesticide purchasing costs.	Re	9	21	0	0	0	129
		%	30	70	0	0	0	86.0
3	The planting pattern with 1 seed per planting hole reduces seed waste and plant maintenance costs.	Re	3	26	1	0	0	122
		%	10	86.7	3.33	0	0	81.3
4	Determining appropriate planting distances reduces seed waste and plant maintenance costs.	Re	3	27	0	0	0	123
		%	10	90	0	0	0	82
5	Fertilizing according to the recommended dosage avoids wasting fertilizer.	Re	6	24	0	0	0	126
		%	20	80	0	0	0	84
6	Using pesticides according to control doses reduces the frequency of application.	Re	3	27	0	0	0	123
		%	10	90	0	0	0	82
7	Scheduled weeding reduces additional labor costs.	Re	1	27	2	0	0	119
		%	3.33	90	6.7	0	0	79
8	Implementation of crop rotation reduces the costs of pest and disease control.	Re	1	13	16	1	0	104
		%	3.33	43.3	50	3.33	0	69.3
9	The use of simple harvesting tools speeds up the harvest and saves labor costs.	Re	2	24	4	0	0	118
		%	6.7	80	13.3	0	0	78.7
10	Storing harvested produce in a suitable place reduces post-harvest losses.	Re	4	26	0	0	0	124
		%	13.3	86.7	0	0	0	82.7
Total		Re	33	223	33	2	0	1193
		%	11	74.3	11	0.7	0	79.5

Based on the data in Table 2, there are 10 (ten) statements used to measure the role of the GAP program in production cost efficiency. The results obtained from the 10 statements

regarding production cost efficiency indicate that the highest score was found in the use of superior, disease-resistant seeds with a value of 129, or approximately 86.0%. This illustrates that farmers consider disease-resistant seeds to be the most effective factor in reducing production costs, particularly by reducing pesticide requirements and the frequency of pest control. Certified seeds used by farmers, such as the NK and Bisi brands, are resistant to major diseases, making control inputs more efficient. On the other hand, the lowest score was found in the application of crop rotation with a value of 104, or 69.3%. This indicates that some farmers have not fully experienced the benefits of rotation in reducing pest control costs. This doubt arises because rotation requires adjustments to cropping patterns and some farmers are only accustomed to growing corn on a large scale. Nevertheless, from a technical perspective, crop rotation can actually break the pest cycle and reduce pesticide requirements when applied consistently.

The overall score of respondents' statements was 1,193, or approximately 79.5%, and falls into the "Playing a Role" category. This category indicates that the *Good Agricultural Practices* (GAP) program plays a significant role in increasing production cost efficiency in corn farming in Tilingkabila District. GAP practices, such as proper land management, the use of superior seeds, appropriate fertilizer and pest control, and scheduled weeding, are considered effective in reducing costs without reducing productivity. Furthermore, the use of simple harvesting tools and proper harvest storage contribute to lower labor costs and post-harvest losses. However, some farmers have not fully benefited from the implementation of crop rotation, as adjustments to cropping patterns and land planning are required. Overall, the application of GAP principles is seen as helping farmers manage resources efficiently, thereby increasing corn farming profits.

3. The Role of the GAP Program in Improving Quality and Selling Price

The quality of agricultural products is a crucial factor in determining the competitiveness and market value of a commodity. In the context of corn farming, quality is measured not only by seed size and uniformity, but also by cleanliness, moisture content, and resistance to post-harvest damage. The implementation of *Good Agricultural Practices* (GAP) plays a strategic role in ensuring crop quality through the implementation of more focused cultivation standards, from seed selection and fertilizer management to proper harvesting techniques and post-harvest handling.

Good corn quality directly correlates with higher selling prices. This is because superior quality corn is more sought after in the market, both as food and animal feed, thereby providing greater economic benefits for farmers. Therefore, the implementation of GAP not only increases productivity but also creates added value by improving the quality of the product. Respondents' statements regarding the role of the GAP program in improving quality and selling prices are shown in the following table:

Table 3. The Role of the GAP Program in Improving Quality and Selling Price

NO	Statement description		Likert Scale					Total Score
			Respondents					
			5	4	3	2	1	
1	The use of superior seeds produces corn with uniform grain size and shape.	Re	8	22	0	0	0	128
		%	26.7	93.3	0	0	0	85.3
2	Balanced fertilization produces dense and nutty corn kernels	Re	13	17	0	0	0	133
		%	43.3	56.7	0	0	0	88.7
3	Proper pest and disease control results in damage-free corn.	Re	12	18	0	0	0	132
		%	40	60	0	0	0	88
4	Harvesting at the right time produces corn with ideal water content.	Re	9	21	0	0	0	129
		%	30	70	0	0	0	86
5		Re	5	25	0	0	0	115

NO	Statement description	Likert Scale					Total Score	
		Respondents						
		5	4	3	2	1		
	Drying corn evenly under the sun maintains good corn quality.	%	16.7	83.3	0	0	0	76.7
6	Storing corn in a dry and clean place prevents mold and quality damage.	Re	10	20	0	0	0	124
		%	33.3	66.7	0	0	0	82.7
7	Sorting the harvest (separating damaged seeds) reduces the risk of decreasing corn quality.	Re	8	22	0	0	0	122
		%	26.7	73.3	0	0	0	81.3
8	Do not mix old and new corn to maintain uniform quality.	Re	11	19	0	0	0	131
		%	33.7	63.3	0	0	0	87.3
9	The use of superior seeds produces corn with a higher selling value.	Re	3	27	0	0	0	123
		%	10	90	0	0	0	82
10	Balanced fertilization produces corn that is more market-preferred and has a better price.	Re	1	28	1	0	0	119
		%	3.3	93.3	3.3	0	0	79.3
11	Corn that is free from pests/disease attacks is easier to sell at a high price.	Re	6	24	0	0	0	124
		%	20	80	0	0	0	82.7
12	Corn harvested with ideal water content has a high shelf life and a higher selling price.	Re	7	23	0	0	0	123
		%	23.3	76.7	0	0	0	82
13	Good drying prevents aflatoxin fungus, making the corn suitable for sale to large buyers.	Re	7	23	0	0	0	123
		%	23.3	76.7	0	0	0	82
14	Sorting the harvest, separating high quality corn which has a better price	Re	8	22	0	0	0	124
		%	26.7	73.3	0	0	0	82.7
15	Good post-harvest handling opens up access to premium markets and increases selling prices.	Re	9	21	0	0	0	125
		%	30	70	0	0	0	83.3
Total		Re	117	333	2	0	0	1855
		%	26	74	0.4	0	0	82.4

Based on the data in Table 3, there are 15 (fifteen) statements used to measure the role of the GAP program in improving the quality and selling price of corn harvests. Of the 15 statements, the highest score was obtained for balanced fertilization resulting in dense and heavy corn kernels with a value of 133 or 88.7%. This high score indicates that farmers believe that the correct dosage and timing of fertilization during both the vegetative and generative phases are very important in determining seed quality, especially through increasing seed density and size, which are the main standards for corn quality in the market. In addition, the third statement regarding proper pest and disease control and the eighth statement regarding not mixing old and new corn also received high scores because both directly affect physical cleanliness, quality uniformity, and the level of damage to the corn, which are factors determining the selling price. Meanwhile, the lowest score was for drying corn evenly in the sun with a value of 115 or 76.7%. Although the scores remain high, this condition indicates that there is still variation in drying methods used by farmers. Differences in drying practices, from pre-harvest drying to post-harvest drying before hulling, to post-hulling drying, result in inconsistent drying results. However, optimal drying is crucial for achieving ideal moisture content and preventing mold growth, which can degrade bean quality and reduce selling price.

The overall score of respondents' statements was 1,855, or approximately 82.4%, and falls into the very influential category. This category indicates that the *Good Agricultural*

Practices (GAP) program plays a significant role in improving the quality and selling price of corn harvests in Tilonkabila District. The implementation of GAP through cultivation and post-harvest activities such as the use of superior seeds, balanced fertilization, appropriate pest control, and timely harvesting is considered capable of improving the quality of the harvest, as indicated by uniformity of seed size, ideal water content, and better shelf life. Furthermore, the implementation of post-harvest practices such as drying, sorting, and proper storage also contribute significantly to maintaining the quality and economic value of the harvest. The corn produced is preferred by the market because it is high quality and meets industry standards, thus providing a better selling price for farmers. Thus, the consistent application of GAP principles not only plays a role in maintaining product quality but also increases income through higher selling prices in the market.

4. (Good Agricultural Practices) Program

From the results of the respondent survey and score analysis, the role of GAP in the context of corn farmers in Tilonkabila sub-district obtained the following results:

Table 4. Final Recapitulation of the Role of the GAP Program

The Role of the GAP Program	Percentage	Category
Increased Production	83.3%	Very Important
Production Cost Efficiency	79.5%	Playing a role
Quality & Selling Price Improvement	82.4%	Very Important
Average	82.33	Very Important

Table 4 shows that the implementation of *Good Agricultural Practices* (GAP) by corn farmers in Tilonkabila District has a positive contribution to several key aspects of farming. The role of GAP in increasing production reached 83.3%, thus categorized as very influential, indicating that practices such as good land management, the use of superior seeds, balanced fertilization, and proper cultivation procedures have a significant impact on increasing corn productivity. The aspect of production cost efficiency obtained a percentage of 79.5% with a role category, indicating that the application of GAP principles, for example the use of appropriate fertilizer and pesticide doses and the application of labor efficiency techniques can reduce input waste, although there is still room for improvement to optimize efficiency. Meanwhile, the increase in quality and selling price reached 82.4%, thus also categorized as very influential; this illustrates that the practice of proper pest and disease control, harvesting at the appropriate physiological time, and post-harvest handling results in better corn quality (uniform size, ideal water content, more attractive physical appearance) so that it has an impact on increasing selling prices at the farmer level. Overall, the average GAP role of 82.33% shows that the GAP program plays a significant role in improving the performance of corn farming businesses in this region.

The results of this study align with the findings of the North Sumatra Agricultural Instrument Standards Implementation Center (BSIP, 2024: 1-2), which confirmed that comprehensive application of GAP from land preparation to harvest can increase corn productivity and quality. Furthermore, research (Adetarami, O. et al., 2021: 32) in Nigeria showed that corn farmers who implemented GAP earned an average profit of ₦ 55,300.33 per hectare with a *Benefit Cost Ratio* of 2.46, indicating efficient input use and increased productivity. These results align with findings in Tilonkabila District, where GAP implementation increased cost efficiency by 79.5% and production yields by 83.3%, indicating that balanced fertilization practices, the use of superior seeds, and appropriate pest control effectively reduce costs while increasing yields.

CONCLUSION

The conclusion of this study shows that the GAP Program has a very influential role in the income of corn farmers in Tilogkabila District, which is indicated by indicators of increased production by 83.3%, production cost efficiency of 79.5%, and quality and selling price of 82.4%, with an average role reaching 82.33% which is included in the very influential category where this finding confirms that GAP is able to increase productivity, business efficiency, and potential income of farmers. Based on these results, it is recommended that farmers implement GAP more comprehensively and consistently, agricultural extension workers increase the intensity of mentoring and socialization, local governments provide support in the form of facilities, policies, and incentives, the central government ensures the availability of fertilizers and tightens distribution supervision, and further researchers expand the scope of the study and add other variables to obtain a more comprehensive understanding of the impact of GAP on corn farming.

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