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The Effect of Implementing Good Agriculture Practices and Climate Change Adaptation Strategies on Shallot Production in an Effort to Improve Farmer Welfare

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Abstract: As with other horticultural crops, shallot production is influenced by the local climate (season). This research aims to find out how Good Agriculture Practice and climate change adaptation strategies are implemented in shallot production in Mojorejo village, Kedungadem District, Bojonegoro Regency, and to find out how the application of Good Agriculture Practice and climate change adaptation strategies in shallot production affects farmers' welfare. The analysis used in this research is descriptive statistical analysis and Partial Least Squares SEM (PLS-SEM). Sampling was carried out using the Slovin formula with the proportionate sampling method, namely 51 respondents. The results of the research show that the influence of good agricultural practices and climate change adaptation strategies on red onion production on welfare has a positive and positive impact of 0.47. In the good agricultural practice variable, the most dominant regulation is social analysis, 0.89, in the strategic variable adapting to non-water climate change, the most dominant is 0.91 in plant management. The most dominant regional welfare variable is social security management at 0.88. With the implementation of good agricultural practices and strategies for adapting to changes in climate, the health and level of leadership of agricultural families increases.

Keywords: Climate change adaptation strategy; Good agriculture practice; Welfare

Introduction

The high consumption of shallots is influenced by the increase in population, improvements in transportation facilities, and increased business in the culinary sector. The increase in shallot consumption in Indonesia is also accompanied by an import policy to meet national needs, however, imports will affect the price of shallots at the consumer level and producers in Indonesia. The largest potential for shallot horticulture in Bojonegoro district is in Kedungadem sub-district.

Mojorejo is one of 23 villages in Kedungadem District, Bojonegoro Regency, where almost all of the people work as shallot farmers. Suitable natural conditions and the availability of large enough land have the potential to be used as rice fields and onion planting areas. However, based on a preliminary survey, the income from the shallot harvest has decreased every year. The decline in the price of shallots in Mojorejo village is influenced by the quality of the goods, and the low level of productivity indicates that farming business management is inefficient. Unfriendly natural conditions will increase the risks of farming such as crop failure, this shows that shallot production still experiences obstacles in cultivation methods and climate. Climate change has threatened various aspects of life, including agriculture, which is the economic mainstay of the majority of the population in Mojorejo

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village. Shallot production is influenced by the local climate (season), because shallots are very sensitive to rain and drought. According to Suwandi (2014) climate change will have an impact on agricultural production failure and the development of pests and diseases, so that the development of shallots in conditions of uncertain climate change is a challenge that needs to be anticipated.

Shallot cultivation carried out by farmers generally does not use technology according to correct cultivation rules and still uses conventional methods that rely on approximate knowledge. Farmers who have no knowledge of shallots cultivate shallot plants based on experience and habit alone. Conventional methods of planting shallots have not provided optimal results for farmers. And based on a preliminary survey, the income from the shallot harvest has decreased every year. The decline in the price of shallots in Mojorejo village is influenced by the quality of the goods, and the low level of productivity indicates that farming business management is inefficient. Unfriendly natural conditions will increase the risk of farming such as crop failure, this shows that shallot production still experiences obstacles in cultivation methods and climate. Therefore, the correct application of cultivation techniques is necessary so that the shallot harvest has added value and has an impact. on farmer welfare.

By implementing Good Agriculture Practice (GAP), farmers are expected to be able to: Improve the quality of shallot harvest based on non-perishable standards, guarantee the product is safe for consumption because it uses fertilizer that does not exceed the dosage, handle shallot pests appropriately according to IPM Integrated pest management, increase farmers' income when crop productivity increases, high quality at high prices, efficient use of natural resources, minimizing risks to the environment. The use of chemicals such as chemical fertilizers results in a decrease in soil fertility levels. This can cause the quality of shallots produced from Mojorejo Village to decrease every year.

The application of Good Agriculture Practice (GAP) to shallot plants can be viewed from several aspects or dimensions, including economic dimensions, social dimensions, institutional dimensions and environmental dimensions. The economic dimension is a reflection of whether or not a farming activity can obtain results that are economically sustainable for the farmer's income. The social dimension is a reflection of how the human social system that occurs and is ongoing can or does not support the farmer's income. The institutional dimension is a description of the availability of an institution that will have an influence on the farmer's business activities. And the environmental or ecological dimension is a reflection of the good or bad quality of the environment and resources in farming as well as the natural processes within it.

Lack of understanding regarding appropriate cultivation techniques and in accordance with standard operational procedures, especially the use of inappropriate fertilizers and pesticides, inappropriate pest control or inappropriate IPM (Integrated Pest Control) hampers the quality of the shallot harvest itself.

By implementing good agricultural practice (GAP), it is hoped that farmers will be able to: improve the quality of the shallot harvest based on standards that are not easily rotten, guarantee that the product is safe for consumption because it uses fertilizer that does not exceed the dosage, handle shallot pests appropriately. According to IPM for integrated pest management, Increasing farmers' income when crop productivity increases, high quality at high prices, efficient use of natural resources, Minimizing risks to the environment. The use of chemicals such as chemical fertilizers results in a decrease in soil fertility levels. This can cause the quality of shallots produced from Mojorejo Village to decline every year.

Farmers in Mojorejo Village often rely on traditional tools to control pests. This tool is often inefficient and even crop failure often occurs due to attacks by leaf caterpillar pests. Farmers are now faced with the risk of seasonal uncertainty, which will impact commodity quality and even crop failure. Climate change encourages farmers to adapt their agricultural activities to climatic conditions to minimize these risks. Farmers in Mojorejo Village tend to make the beds lower so that the shallot plants are easily flooded when rainfall is high. The rain factor is also one of the causes of not maximizing production levels. And on the other hand, many farmers do not have small reservoirs to store water to anticipate drought or low rainfall.

In Peng et al. (2020) experts suggest that adjusting agricultural production has become a common adaptation strategy. Common agricultural adaptation strategies can be categorized into three categories. The first category is improvement through diversification, including diversification of crop varieties and sources of income. Crop variety diversification refers to selecting new plant varieties in environments with lower damage potential to overcome natural hazards based on crop improvement and adaptation, for example, selecting drought-resistant varieties in dry areas and practicing intercropping. The second category is crop management, referring to changes in planting dates and locations. The purpose of changing the planting date is to change the length of the planting period or planting period of a crop and the harvest date so that critical stages of crop growth can avoid peak periods of natural hazards, for example, planting mature crop varieties before the start of the flood season in flood-prone areas.

The third category is adaptation from a productivity-enhancing perspective, including improved soil conservation and irrigation, representing a defensive adaptation strategy. Improving irrigation increases agricultural productivity by increasing rainwater during the dry season, allowing farmers to reduce crop losses due to drought. In this research, the diversification category climate change adaptation strategy was not used because all types of shallot variants will not increase their productivity if good and correct cultivation methods are not implemented. According to Purba et al. (2015), the most important thing about welfare is income, because several aspects of household welfare depend on the level of income, the income of shallot farmers increases by increasing shallot harvests in terms of quality and quantity.

It is important to carry out research regarding the application of Good Agriculture Practice and climate change adaptation strategies to shallot harvest in Mojorejo Village, Kedungadem District, Bojonegoro Regency. The aim is to improve the quality of shallots in order to improve the welfare of farmers in Mojorejo village.

Method

Research uses a quantitative approach. Quantitative data was obtained from the results of questionnaire answers to respondents using the survey method. The research location was determined purposively, namely in Mojorejo Village, Kedungadem District, Bojonegoro Regency. The research location was determined purposively, namely in Mojorejo Village, Kedungadem District, Bojonegoro Regency. The reason for determining and determining this area as a research area is because most of the people in Mojorejo Village work as shallot farmers. The research was conducted from October 2023 to March 2024.

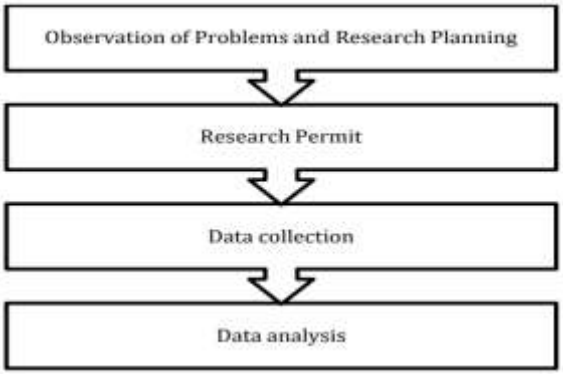

Figure 1. Research scheme

In this research, using the Slovin formula to obtain a population size of 103 farmers in Mojorejo village which was measured based on the number of shallot farmers according to the proportionate sampling method and the number of samples using the Slovin method was 51 respondents. The analytical method in this research is divided into two parts, namely Descriptive statistical analysis and SEM-PLS, SmartPLS analysis in this research were carried out on the measurement model (outer model), structural model (inner model) and hypothesis testing.

Results and Discussion

Evaluation of the measurement model (outer model) is used to measure how well the indicator measures the latent variable it represents and ensures that the latent variable being measured correctly reflects the concepts to be tested in the SEM analysis.

Evaluation of the Measurement Model (Outer Model)

Evaluation of the outer model stage 1 (first order) refers to a structural model involving latent variables or constructs that are measured directly by the indicators. In first order SEM-PLS each latent variable is explained at the first level. In this research, first order is carried out on constructs that measure directly the indicators in the economic dimension (X1.1) with 4 items, the social dimension (X1.2) with 3 items, the institutional dimension (X1.3) with 3 items, and the environmental dimension (X1.4) with 3 items, as well crop management (X2.1) with 2 items, and increasing productivity (X.2.2) with 3 items, as well as living conditions (Y.1) with 2 items, economic situation (Y.2) with 4 items, social security (Y3) with 2 items, psychological condition (Y.4) with 1 item. These items are reflective. The results of testing the validity and reliability of the first order are as follows:

Reliability and Convergent Validity Test

In research at this stage, measurement model evaluation is used to test the reliability and validity of the instrument for each dimension indicator. Reliability test results can be determined using the following criteria, including Cronbach's alpha and composite reliability, both of which must show a value greater than 0.7 in order to be declared reliable (Hair et al., 2017). The convergent validity test is used to measure whether the questionnaire is valid or not. This needs to be done to find out whether the measuring instrument that has been prepared can actually measure what needs to be measured. The measurements were carried out because the preparation of the research questionnaire was carried out based on the theoretical construction of each variable in the research. Then these variables are made more specific to measure latent variables using dimensions and then looking for indicators. Next, the indicators are described in each measurement item in the

questionnaire. This test can be determined by looking at the outer loading and average variance extracted (AVE). Where the indicator is considered valid if the outer loading is greater than 0.7 and the AVE shows a value above 0.5 (Hair et al., 2014) these conditions must be met so that the next stages can be carried out. The test results can be seen in the Table 1.

Based on the data in the table 1, it shows that all outer loadings are shown with a loading factor value greater than 0.7, the Cronbach's alpha and composite reliability rho_a values show both values greater than 0.7, while the average variance extracted (AVE) value is greater than 0.5 so it can it is said that all indicators that explain the dimensions of the latent variable have met the requirements and can be said to be reliable and valid.

Next, an evaluation of the outer model stage 2 was carried out, on the variables good agricultural practice (X1) and climate change adaptation strategies (X2). Where the good agricultural practice variable has 4 dimensions, namely the economic dimension (X1.1), social dimension (X1.2), institutional dimension (X1.3), and environmental dimension (X1.4) and the climate change adaptation strategy variable has 2 dimensions. namely crop management (X2.1), and increasing productivity (X2.2), and the welfare variable has 4 dimensions, namely living conditions (Y1), economic situation (Y2), social security (Y3), and psychological conditions (Y4). The indicators are reflective. The results of testing the validity and reliability of the second order are as follows.

Convergent Validity Test and Reliability Test

Evaluation of second order outer model testing can be determined through testing the validity and reliability of research instruments. The validity test carried out in this research was based on convergent validity and discriminant validity values. The convergent validity test at both the first order and second order stages is measured based on the loading factor and AVE values. According to Hair et al. (2014), an indicator is considered valid if the outer loading is greater than 0.7 and the AVE shows a value above 0.5, the outer loading value for each variable dimension/ indicator is shown in the following table 1.

Table 1. Validity and Reliability Test Results at Dimension Level

	Code	Loading factors	Cronbach's alpha	Composite reliability (rho_a)	Average variance extracted (AVE)
Economic dimension	ED1	0.85	0.88	0.88	0.73
	ED2	0.83			
	ED3	0.87			
	ED4	0.86			
Social dimension	SD1	0.89	0.88	0.88	0.81
	SD2	0.9			
	SD3	0.91			
Institutional dimension	ID1	0.9	0.86	0.86	0.78
	ID2	0.87			
	ID3	0.87			
Environmental dimensions	ED1	0.89	0.87	0.87	0.8
	ED2	0.89			
	ED3	0.89			
Plant management	PM1	0.9	0.76	0.76	0.8
	PM2	0.89			
Increased productivity	IP1	0.85	0.75	0.75	0.66
	IP2	0.76			
	IP3	0.83			
Living conditions	LS1	0.92	0.8	0.8	0.83
	LS2	0.9			
Economic situation	ES1	0.82	0.85	0.85	0.69
	ES2	0.81			
	ES3	0.82			
	ES4	0.86			
Social security	SS1	0.92	0.8	0.81	0.84
	SS2	0.91			
Psychological condition	PC1	1	1	1	1

Based on Table 1, it is known that all outer loadings for each variable are more than 0.7 or can be categorized as valid. The social dimension shown in Figure 2 shows the most dominant dimension in the good agricultural practice variable. This can be indicated that the social dimension is effective and appropriate to use in this research to obtain information on how appropriate the implementation of good agricultural practices is in the

proper and correct cultivation of shallots. As research of Puspitasari (2017) also shows that the social dimension is the strongest dimension in explaining the variables of good agricultural practice and very sustainable.

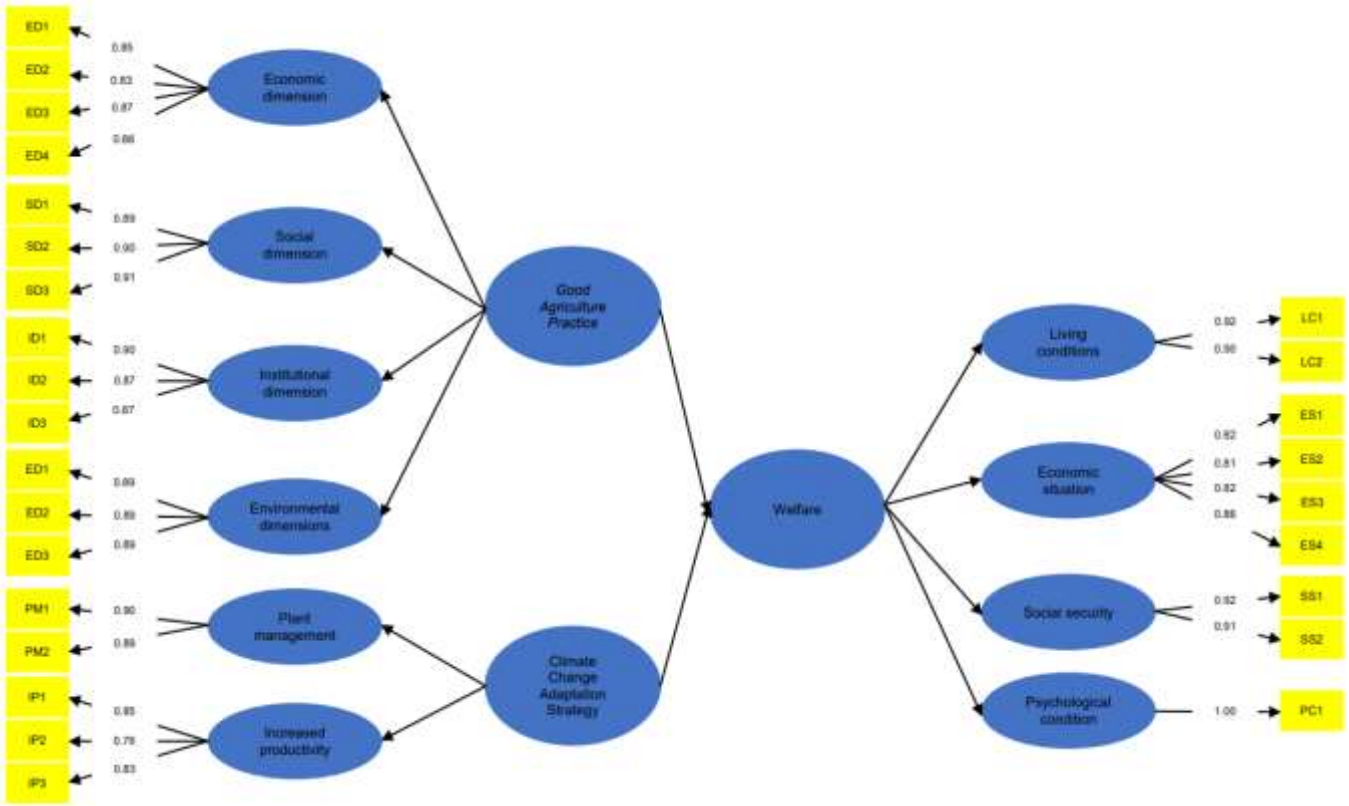

Figure 2. Outer model results (Fist order)

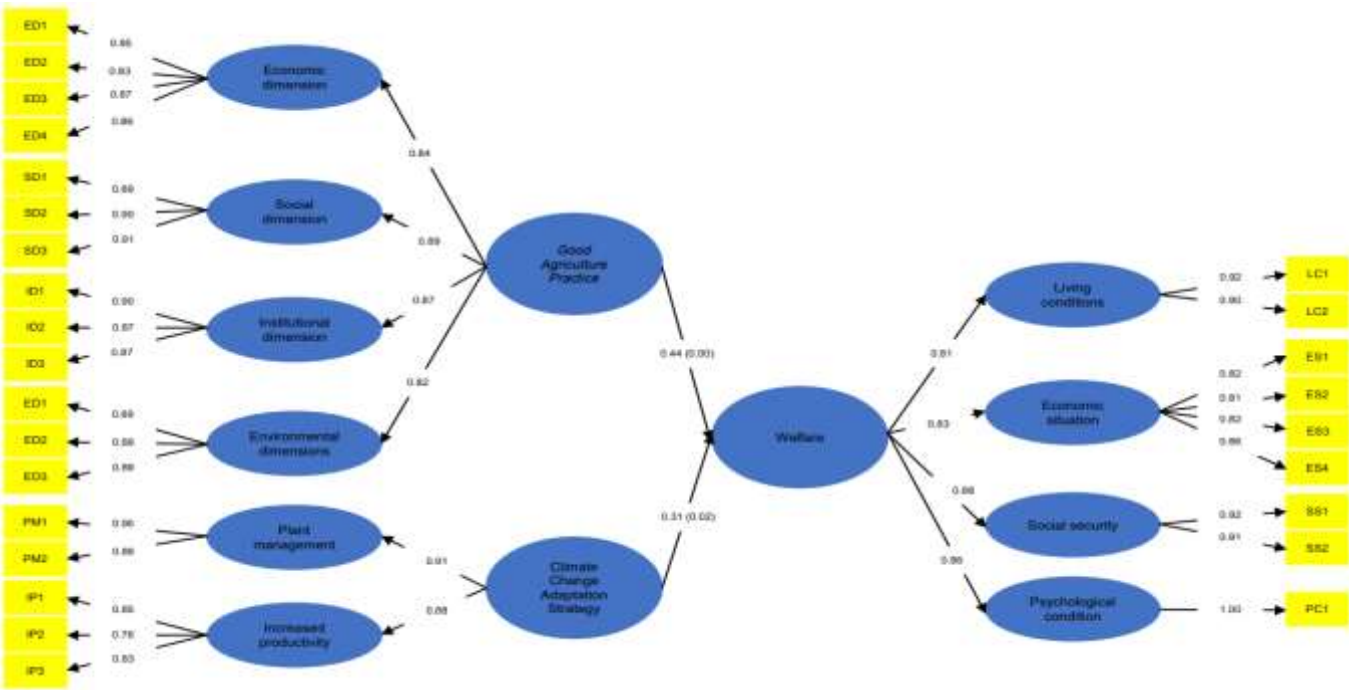

Figure 3. Outer model results (Second order)

Plant management in Figure 2 shows the most dominant dimensions of the climate change adaptation strategy variable. This could indicate that crop management is considered the most appropriate to use in this research to obtain information on how appropriate the implementation of climate change

adaptation strategies is in an effort to avoid the risk of crop failure due to high rainfall. This is supported by research by Turasih et al. (2016) which shows that to anticipate the high rainy season and storms that can occur at any time, namely by advancing the planting month. And this is supported by Muslim (2013), to anticipate erratic rainfall, this is done by advancing the planting schedule or carrying out a stealth planting start.

Based on Figure 2, it can be seen that the results of the second order condition have the highest factor loading for the good agricultural practice variable on the social dimension of 0.89, this means that this social dimension consists of indicators of networks of fellow farmers, networks of farmers with related agencies and family participation. is a positive dimension and is the strongest influence on the latent variable good agricultural practice. And the highest factor loading of the climate change adaptation strategy variable in the plant management dimension is 0.91, this means that this plant management dimension, which consists of indicators of planting time and planting location, is a positive dimension and has the strongest influence on the latent variable of climate change adaptation strategy. Meanwhile, the highest factor loading of the welfare variable on the social security dimension is 0.88, this means that this social security dimension, which consists of health and education indicators, is a positive dimension and is the strongest influence on the welfare latent variable.

Table 2. Outer Loadings Second Order

Dimensions	Outer loadings	Information
Good Agriculture Practice		
ED <- GAP	0.84	Valid
SD <- GAP	0.89	Valid
ID <- GAP	0.87	Valid
ED <- GAP	0.82	Valid
Climate Change Adaptation Strategy		
PM <- CCAS	0.88	Valid
IP <- CCAS	0.91	Valid
Welfare		
LS <- WELFARE	0.81	Valid
ES <- WELFARE	0.83	Valid
SS <- WELFARE	0.88	Valid
PC <- WELFARE	0.86	Valid

After evaluating the loading factor, the next step is to test validity by checking the average variance extracted (AVE) value and test reliability by paying attention to Cronbach's alpha and composite reliability values for all dimensions. The test results can be seen in the Table 3.

Based on Table 3, it is known that the AVE value is greater than 0.5, then the Cronbach's alpha value, and composite reliability are greater than 0.7 so it can be said that all dimensions that explain the latent variable have met the requirements and can be said to be valid and reliable, in line with the statement Hair et al. (2014) so that they have a strong basis for evaluating the structural model (inner model).

Table 3. Reliability Constructs

	Cronbach's alpha	Composite reliability (rho_a)	Average Variance Extracted (AVE)
GAP	0.88	0.89	0.74
CCAS	0.76	0.76	0.8
WELFARE	0.87	0.88	0.72

Structural Model Evaluation (Inner Model)

Structural model testing (inner model) is carried out to determine the magnitude of the correlation between variables and the ability of each exogenous latent variable to influence the endogenous latent variable. The test results can be seen based on three criteria, namely the R-Square coefficient of determination analysis test, Model-Fit analysis and path coefficient (Path Coefficient) in the inner research model.

Coefficient of Determination Analysis (R-Squared)

The R-Square value shows the variability of endogenous variables that can be explained by exogenous variables. A criteria for an R Square value of 0.67, 0.33 and 0.19 as strong, moderate and weak. The R-Square results in this study are shown Table 4.

Table 4. R-squared

	Welfare
R-squared	0.47
R-squared adjusted	0.44

Based on Table 4, it is known that the R-Square value of effectiveness is 0.47 are in the moderate or moderate category. As much as 47% of the increase in welfare can be influenced by the variables good agricultural practice and climate change adaptation strategies, the remaining 53 % is influenced by other variables outside this research model.

Model-Fit Analysis

SRMR (Standardized Root Mean Square Residual) is a measure of model fit, namely the difference between the data correlation matrix and the estimated model correlation matrix. According to Fueki et al. (2011) model fit is considered to meet the requirements if the SRMR value is less than 0.10. Meanwhile, according to Hair et al. (2021) a good NFI value must be between 0 and 1, the closer the value is to 1, the better. The Model-Fit Test results can be seen in Table 5.

Based on Table 5, the model estimation results are obtained, namely an SRMR value of 0.08 < 0. 10 and the model is declared to meet the requirements. Next, look

at the Normal Fit Index (NFI) where the score range is 0-1, where the closer it is to 1, the better the model built. The results of the NFI value in this study were 0.76 (close to 1) so it can be concluded that the data describes the overall model or the model fits the data.

Table 5 Model-Fit

	Saturated models	Estimated model
SRMR	0.08	0.08
d_ULS	0.37	0.37
d_G	0.26	0.26
Chi-square	80.96	80.96
NFI	0.76	0.76

Hypothesis Test

Testing of the direct influence hypothesis in this research was carried out by looking at the t statistic value and P value from the bootstrapping test results. The hypothesis results are declared accepted if the t statistic value > t table (1.65) or P value < 0.5. Statistical values of the research hypothesis can be seen in Table 6.

Table 6. T Statistics

	Path coefficient	T statistic	P values	Information
GAP-WELFARE	0.44	3.60	0.00	Accepted
CCAS-WELFARE	0.31	2.24	0.02	Accepted

Based on Table 6, the results obtained from testing the Good Agriculture Practice -> hypothesis on welfare obtained a t statistics value (3.60) > t table (1 .65) and P value (0.00) < 0.05 which means that Hypothesis 1 is accepted. These results indicate that the Good Agriculture Practice variable has a positive and significant influence on welfare as indicated by a path coefficient value of 0.44.

And the results obtained from testing the hypothesis of climate change adaptation strategies -> on welfare obtained t statistics values (2.24) > t table (1.65) and P value (0.02) < 0.05 which means that Hypothesis 2 is accepted. These results indicate that the climate change adaptation strategy variable has a positive and significant influence on welfare as indicated by a path coefficient value of 0.31.

Discussion

Application of Good Agriculture Practice in Shallot Production

The main aim of this research is to determine the application of good agricultural practices to welfare. Based on the results of the data analysis that has been carried out, it is known that there is an increase in the quality of shallots, as well as increasing the welfare of farmers which is influenced by the dimension that has the highest number, namely the social dimension. This is supported by the environment where farmers who live in villages really uphold social values, they exchange information, problems and solutions related to shallots. Routine extension activities are carried out by PPL at farmer group forums to provide information regarding shallot cultivation. This activity always involves the family in the planting and harvesting process. Family involvement in the planting and harvesting process can minimize farming costs. This is also explained in Suratman (2015), the availability of labor in the family is quite large potential in farming activities, because having labor in the family means that a number of costs that should be incurred as wages for labor outside the family will become part of the farmer's family income. Utilization of labor in the family is a cost contribution to farming activities or in other words will reduce costs or labor wages. Farming costs can be minimized with the role of the family.

The social dimensions shown in Figure 2 show the most dominant dimensions. This can be indicated that the social dimension is effective and appropriate to use in this research to obtain information on how appropriate the implementation of good agricultural practices is in the proper and correct cultivation of shallots. As Puspitasari (2017), also shows that the social dimension is the strongest dimension in explaining the variables of good agricultural practice and very sustainable. This is supported by Bathaei et al. (2023), Serebrennikov et al. (2020), and Bertola et al. (2021), the most influential strategy in sustainable good agricultural practice is the performance of agricultural instructors in empowering farmers, namely by increasing the competency of agricultural instructors, and this is included in the social dimension indicator category.

Implementation of Climate Change Adaptation Strategies in Shallot Production

Climate change adaptation strategies are an alternative for farmers to reduce the negative impacts caused by climate change. The most influential dimension is crop management, crop management is carried out referring to changes in planting dates and locations. The timing for planting shallots is carried out earlier in October, this is to avoid the risk of crop failure due to weather factors, namely high rainfall at the end of the year and the beginning of the year. The planting location was moved to anticipate land that has become critical due to exposure to chemicals.

Plant management in the picture 2 shows the most dominant dimension. This could indicate that crop management is considered the most appropriate to use in this research to obtain information on how appropriate the implementation of climate change

adaptation strategies is in an effort to avoid the risk of crop failure due to high rainfall. This is supported by research by Turasih et al. (2016) which shows that to anticipate the high rainy season and storms that can occur at any time, namely by advancing the planting month. And this is supported by Muslim (2013), to anticipate erratic rainfall, this is done by advancing the planting schedule or carrying out a stealth planting start.

The Influence of Good Agricultural Practices and Climate Change Adaptation Strategies on Farmers' Welfare

Based on the results of data analysis in Figure 2 , it is known that the good agricultural practice variable is influenced by four dimensions, namely, economic dimension, social dimension, institutional dimension, and environmental dimension. The outer loading value for the economic dimension is 0.84 or declared valid, which means that farming activities obtain economic results including the ease of selling shallots and the income received by farmers increases after implementing good agricultural practice procedures. The outer loading value for the social dimension is 0.89 or declared valid, farmers can easily obtain information from local PPL officers and the social system for farmers exists and continues to support farmer welfare. The outer loading value for the institutional dimension is 0.876 or declared valid, which means that farmers actively attend farmer group forums and there is training on how to cultivate shallots properly and correctly by PPL officers. The outer loading value for the environmental dimension is 0.82 which means that the application of fertilizer by farmers is appropriate according to recommendations, the appearance of the shallot bulbs produced tends to be greater after applying the GAP procedure. So, in general it can be seen that these four indicators influence the good agricultural practice variable. Likewise, Puspitasari (2017), shows that the conditions of the economic aspects, social aspects, institutional aspects and environmental aspects of each attribute in the implementation of good agricultural practices (GAP) for dragon fruit in Jambewangi Village are mostly in good condition. Where the dimensions in the very sustainable category are the social dimension and institutional dimension. And in the research of Bajgain et al. (2024) GAP has many benefits for farmers, such as producing high quality production, and increasing agricultural income. The research results show that farmers are more likely to adopt GAP related to management practices during production. This is supported by research by Al-Aziz et al. (2024) research results show that the policies implemented are proven to be able to increase chili productivity through the implementation of GAP.

Based on the results of data analysis in Figure 2, it is known that climate change adaptation strategy variables are influenced by two dimensions, namely crop management and increasing productivity. The outer loading value for plant management is 0.91 or declared valid, which means farmers plant shallots early to anticipate high rainfall and move land to anticipate critical land. The outer loading value for increasing productivity is 0.88, which means farmers are making improvements to soil conservation and irrigation to anticipate high rainfall and drought. So, in general it can be seen that these two dimensions influence climate change adaptation strategy variables. This is supported by Bello et al. (2024), CSAT, namely Climate Smart Agricultural Technology, as a form of adaptation, to mitigate the negative impact of climate change on crop producers in developing countries. The right CSAT can reduce the impact of climate change and increase agricultural production. CSAT covers a variety of agronomic practices and technologies such as land management practices and soil conservation. In the research of Bhuyan et al. (2024), the strategy carried out does not only carry out land leveling and planting calendars, but they also add to increasing awareness and capacity building activities among farmers. The research results show that the implementation of this policy has a positive and significant effect on the implementation of climate change adaptation strategies and increasing agricultural production.

In accordance with the results of the analysis that has been carried out, it is known that the good agricultural practice variable and the change adaptation strategy variable have an influence on improving farmer welfare. (1) living conditions in farming families can be seen from the physical condition of the residence and environment, the village community's land ownership status and privately owned houses, part of the harvest is invested in house renovations, community welfare is the fulfillment of basic needs which is reflected in a decent house. (2) The economic situation to meet household needs depends on the level of income received, families with high incomes will have more of their household needs met compared to those with low incomes. After harvesting shallots, spending increases for primary needs such as shopping for food every day and secondary shopping for buying means of transportation that follow trends, household furniture, etc. According to Bleys et al. (2015) who state that every time there is an increase in average income it will increase welfare. (3) According to Qu et al. (2023), social security includes health level and education level. Families who have a high level of health tend to feel more prosperous than those with low health, because families who have a high level of health tend to be more active in terms of production activities, reducing the amount of stress felt by farmers after successfully harvesting shallots, usually many farmers experiencing hypertension because they

think about their shallot crops failing to harvest and not returning their investment. The increase in farmers' income has an impact on people realizing the importance of education because farmers no longer mind the issue of school fees for their children. (4) The psychological condition in farmer households is characterized by satisfaction in the financial situation after harvesting shallots, the satisfaction felt by farmers when the harvest is abundant and prices are fair in line with quality.

Based on the analysis that has been carried out, it is known that the good agricultural practice variable has a positive and significant effect of 0.00 with a P-Value criteria value ≤ 0.05 towards the welfare of farmers. This is supported by research by Sitorus, 2021, showing that the results of implementing GAP by white pepper farmers have had a significant impact on increasing productivity, increasing income driven by increased production and improving the quality of white pepper.

While 0.02 with a P-Value criterion value ≤ 0.05 climate change adaptation strategies have a positive and significant effect on farmer welfare. This is supported by research by Priyanto et al. (2021) which shows that farmers who implement adaptation strategies obtain higher productivity and income than farmers who do not implement adaptation strategies.

The relationship between the two variables good agricultural practice and climate change adaptation strategies, these two variables both have a role to play in supporting efforts to improve the quality of shallots. The role of good agricultural practice as a reference or guideline for how to cultivate shallots properly and correctly. The role of climate change adaptation strategies is to adapt to the natural environment and to anticipate the risks of an uncertain climate. These two variables are both very necessary for the success of shallot cultivation.

The role of good agricultural practices and climate change adaptation strategies can increase the quality of the shallot harvest, quality shallots will increase the selling price. This of course increases the income received by farmers so that farmers are more prosperous. It can be seen from the research results that the highest dimension value is security. social which includes two indicators of health and education, health indicators can be seen from the decrease in the amount of stress felt by farmers after successfully harvesting shallots. Usually, many farmers experience hypertension because they think about shallot crops failing to harvest. As well as the education indicator, the increase in farmers' income has an impact on people becoming aware of the importance of education because farmers no longer object to the cost of their children's school fees.

Conclusion

Based on the results of the research that has been carried out, it can be concluded that the research results are as follows: The application of good agricultural practices in shallot production is most influenced by the social dimension of 0.89. The communication network between farmers is very high in terms of exchanging information regarding the cultivation process they carry out. The implementation of climate change adaptation strategies in shallot production is most influenced by the plant management dimension of 0.91. The influence of good agricultural practices and climate change adaptation strategies on shallot production on welfare has a positive and significant effect of 0.47. The social security dimension has the highest value of 0.88. With the implementation of good agricultural practices and climate change adaptation strategies, the health and education level of farming families increases.

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