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Farmers' Perception and Adaptation Decision of Rice Farming in Facing Climate Change: A Case Study in Trawas Village, Mojokerto, Indonesia

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Abstract. Climate change is a phenomenon of changes in global temperatures, seasons and erratic rainfall that have an impact on human activities, change people's lives, and etc. This research uses a quantitative survey method. The data obtained were analyzed descriptively to obtain an overview of information, sources of information, perceptions and adaptation of farmers and logistic regression to determine the factors that influence farmers' climate change adaptation practices. The results showed that 67% of farmers felt climate change by relying on climate change information sources from newspapers/TV 42%, extension workers 28%, internet 16%, and friends/relatives 14%. Based on farmers' perceptions with a likert scale of 1= unchanged, 2=slightly changed 3=changed a lot, 4=very changed, climate change with many changing categories found in rainfall season (2.76) dry and rainy season (2.64), air temperature (2.63), length of rainy season (2.69), pest and disease attack (2.79), while the length of dry season changed slightly (2.46) with the most impact felt by farmers is the attack of pests and diseases that increase in longer rainy season. These findings imply that farmers, community organizations, and governments must be aware of climate change in order to mitigate the impact of losses on the rice crop agriculture sector. Farmers will benefit tremendously from the farmer adaptation process, group engagement, and government climate policies such as providing drought and flood-climate-resistant cultivars, early warning systems, facilities, and infrastructure.

Keywords: adaptation strategy; climate change; farmer perception

INTRODUCTION

Climate change has become a global environmental issue and has garnered much attention over the past few decades following the recognition of the impacts of climate change around the world (Karki et al., 2020; Pisor et al., 2023). Climate change will increasingly potentially threaten living things and biodiversity on earth (Sudarma &; As-syakur, 2018). This change is characterized by changes in global temperatures, seasons and erratic rainfall that have an impact on human activities. Ironically, the phenomenon also turned out to be mostly caused by human activities themselves, such as land use conversion and the use of fossil fuels (Supanggih &; Widodo, 2013).

Climate change causes the temperature of the air on the Earth's surface and in the Earth's lower atmosphere to increase, this increase triggers global temperature rise, sea level rise in the lowest layer of the atmosphere and high fluctuations in rainfall that can be felt by people in various parts of the world (Mimura, 2013). Climate change increases weather variability and environmental risks such as droughts, forest fires, and floods (IPCC, 2022). Although climate change has been a constant process on earth, in the last 100 years or so, the rate of variation has increased manifold. Due to anthropogenic activity, average temperatures have increased by 0.9°C since the 19th century, mainly due to greenhouse gas (GHG) emissions in the atmosphere. According to forecasts, this increase is expected to reach 1.5°C by 2050 or maybe even more, given the deforestation that occurs, increased greenhouse gas emissions, and pollution of soil, water bodies, and air (Arora, 2019). Other climate change studies have also shown anthropogenic activity has caused global warming of about 1.0°C above pre-industrial warming levels and this Figure is likely to reach 1.5°C between 2030 and 2052 if current emissions levels continue (Fawzy et al., 2020).

In many cases, extreme events of climate change can strain the capacity of natural and human systems to survive, which in turn creates social, economic and

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ecological impacts. As climate change continues to occur, people in tropical climate regions dependent on natural resources will be increasingly threatened due to climate change that has become more severe and increased over the past few decades. These conditions change people's lives, resources, welfare, and livelihoods (Zscheischler et al., 2020) Therefore, climate change creates major challenges in achieving sustainability through the depletion of natural resources. In addition, these things can also exacerbate the vulnerability of agricultural products (Nelson et al., 2009; Maleksaeidi and Karami, 2012; Gliesman, 2015).

The agricultural sector is one of the livelihoods of people in tropical climates and the basis of economic development is mostly in developing countries. Despite its contribution, agriculture is the most vulnerable sector of the economy to climate change in developing countries. In addition, this condition explains that developing countries do not have enough resources or modern technology to answer the challenges of climate change as an adaptation strategy, and agriculture is very dependent on climate conditions (Aweke et al., 2020). Interpretation of the impacts of climate change will influence in determining adaptation strategy decisions. If climate change is considered detrimental by policymakers and farmers, then climate change adaptation (mitigation) strategies are important to be realized immediately. But, if climate change is considered beneficial, then there is no need to carry out adaptation strategies (Nath &; Behera, 2011).

In line with the explanation above, Indonesia, as one of the developing countries that has a tropical climate and is mostly engaged in the agricultural sector, such as rice, is certainly a serious threat to farmers. Developing countries can experience the effects of climate change, such as droughts, floods, increased air temperatures, and decreased productivity, which will potentially increase the risk of crop failure or reduce production capacity, which can worsen the vulnerability of production yields (Adger, 2006; Fussel, 2007). One of the most consumed food crop sectors in Indonesia is rice, corn, and soybeans. Of the three types of food crops, rice (rice) is a food consumed by about 90% of the total population. This condition is inversely proportional to the production volume which actually tends to experience between 1.02% to 39.83% (Fatima et al., 2022).

The role of the agricultural sector, especially rice, is very important for the Indonesian state because it is the third largest contributor to Gross Domestic Product (GDP) as a driver of the national economy (BPS, 2022). According to a report by the Central Statistics Agency (BPS), the average rice consumption of the Indonesian population has increased since the pandemic. In 2018 rice consumption of all types, including local, superior quality, and imported rice, averaged 1,404 kg per capita per week (BPS, 2022).

In Indonesia, the three provinces that contributed the largest rice harvest area in 2022 are East Java, Central Java, and West Java Provinces with harvest areas of 1.69 million hectares, 1.69 million hectares, and 1.66 million hectares respectively (BPS, 2023). One of the rice-producing areas in East Java is Penanggungan Village, Trawas, Mojokerto Regency. Rice production in Mojokerto district from 2019-2022 decreased from 339,800 tons to 287,251 tons (BPS, 2023). According to the Government of Mojokerto (2019), the decline in rice production is partly due to climate change, which increases the attack of plant pest organisms (OPT). Identification as a follow-up to the case is needed in increasing agricultural productivity, especially the study of aspects of climate change and technical efficiency. Therefore, to identify these problems, researchers asked several questions, including: Therefore, to identify these problems, researchers asked several questions, including: 1. Farmers' perceptions in facing the threat of climate change in

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Trawas District, Mojokerto Regency, East Java 2. Factors that influence farmers in adaptation decisions in Trawas District, Mojokerto Regency, East Java

METHODS

The research was conducted in Trawas, Mojokerto Regency, East Java with the consideration that the location is prone to drought. Initial observations found that rice farming in this area is terraced. Farmers also revealed that changes in rainfall patterns, prolonged drought, and pest and disease attacks have been felt lately. These changes, if left unchecked, can cause flooding, landslides, and the risk of crop failure is one of the threats of climate change for rice farmers. In this study, the population studied was all rice farmers in Trawas village. Based on an initial survey of farmer groups the population of rice farmers is unknown due to lack of information from local institutions. so this study uses the survey method in the sampling process with random sampling. This research was conducted in August 2023.

The data sources of this research are primary and secondary data. Primary data were obtained from observation and interviews assisted by questionnaires, while secondary data were obtained from relevant agencies such as the Agriculture Office and the Central Bureau of Statistics. The data obtained were analyzed descriptively to obtain an overview of the forms of climate change. Descriptive analysis can be used when researchers describe sample data. (Sugiyono, 2018). The descriptive analysis in this study is socio-demographic, climate change information, and climate change impacts. Meanwhile, the factors that influence farmers' adaptation will be determined using binary logistic regression. Binary logistic regression is a statistical analysis method to describe the relationship between dependent variables that have two or more categories with one or more categorical or continuous scale independent variables (Hosmer and S. Lemeshow. 2000). The binary logistic regression model is used to analyze the relationship between one response variable and several predictor variables, with the response variable in the form of dichotomous qualitative data, which is 1 to indicate the presence of a characteristic and 0 to indicate the absence of a characteristic.

The binary logistic regression model is used if the response variable produces two categories valued at 0 and 1, thus following Bernoulli's distribution (Agresti, 1990) is shown in Equation 1.

$$f(y_i)= \pi^{y_i} (1- \pi_i)^{(1-y_i)} \quad (1)$$

where:

π_i = probability of i-th occurrence

y_i = i-th random variable consisting of 0 and 1

The form of a logistic regression model with one predictor variable is :

$$\pi (x)=\frac{\exp(\beta_0+\beta_1 x)}{1+\exp(\beta_0+\beta_1 x)} \quad (2)$$

To make it easier to estimate regression parameters, the $\pi(x)$ in the equation above is transformed to produce the form of logistic regression logit, as follows:

$$g(x)=\ln\left[\frac{\pi(x)}{1-\pi(x)}\right]= \beta_0+ \beta_1 X \quad (3)$$

RESULTS AND DISCUSSION

Climate change has serious impacts that affect rice farming activities, such as changes in rainfall patterns, rising temperatures, and pest and disease attacks. According to Shrestha et al. (2017), farmers mostly feel higher temperatures and heat waves, leading to long droughts in the dry season, more variability in the rainy season, and shorter growing seasons with higher levels of uncertainty and shorter rainfall duration than before. Climate change puts pressure on rice plants, which causes production to decline (Wurdiana Shinta, 2021).

Based on the previous explanation, the perception of rice farmers is needed as a first step in responding to climate change. A better level of understanding can encourage farmers to make decisions through strategies to reduce impacts and risks. To further review the amount of

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knowledge and understanding of farmers related to climate change, researchers need respondent characteristics that provide information related to demographic characteristics (age, education, family dependents, side jobs, experience, land status, land area), and institutional factors (obtaining extension workers, farmer groups, weather information). An overview of farmer household characteristics will help in understanding farmer adaptation behavior.

Table 1. Descriptive statistical analysis

Household Characteristics			
Variable	**Indicators**	**Mean**	**Std. Dev.**
Age	Farmer Age (Years)	54.15	9.543494
Education	Duration of Education (Years)	7.33	2.141721
Farming experience	Length of Farming (Years)	29.79	1.319113
Number of Family Members	Family Dependents	3.48	.9372213
Side job	Dummy, 1 =Have a side job, 0 =no	.62	.4878317
Land status	Dummy, 1 =Own Land, 2 =Rent, 3=Profit Sharing	1.18	.5389852
Land area	Area of land managed by farmers (m2)	3722	4.848406
Institutional Factors			
Variable	**Indicators**	**Mean**	**Std. Dev.**
Counseling	Dummy, 1=Obtaining counseling, 0=no	.76	.4292347
Farmer Group	Dummy, 1=active farmer group, 0=no	.66	.4760952
Weather Information	Dummy, 1= Obtaining Weather Information, 0=no	.67	.4725816
Number of Observation n=100			

Source: Primary Data, 2023

The results of descriptive statistical analysis inform that based on the sociodemographic characteristics of farmer households, based on the **Table 1** farmers are still in productive age where the productive age range is 15-64 years, 7 years of farmer education indicates the potential for adoption of knowledge and technology is low, the longer farming experience will be difficult to adopt new methods. The number of family members participating will increase income, having a side job indicates the income of rice farmers is not enough to meet the needs, status and land area will affect farmers in production. While on institutional factors, all farmers receive counseling, weather information, and join farmer groups, which means farmers have access to information in dealing with climate change. According to Barnes, al., (2020), assets in households play an important role related to flexibility in determining strategies. Education and experience influence the way individuals respond to change, while institutional factors, such as organization, social construction, and the environment when looking at things will affect the behavior of each individual in the social group m^2

Climate Change Information

Information is very important for every individual in learning something that can be obtained from the surrounding environment. Based (see **Figure 2**) the number of recipients of climate change information is 67% receiving information and 33% receiving no information. This is in line with research in Indramayu that access to information is very important for farmers in estimating the right planting time (Nuraisah & Budi Kusumo, 2019). This shows that more than half of the respondents studied received climate change information. Thus, respondents know and feel about climate change.

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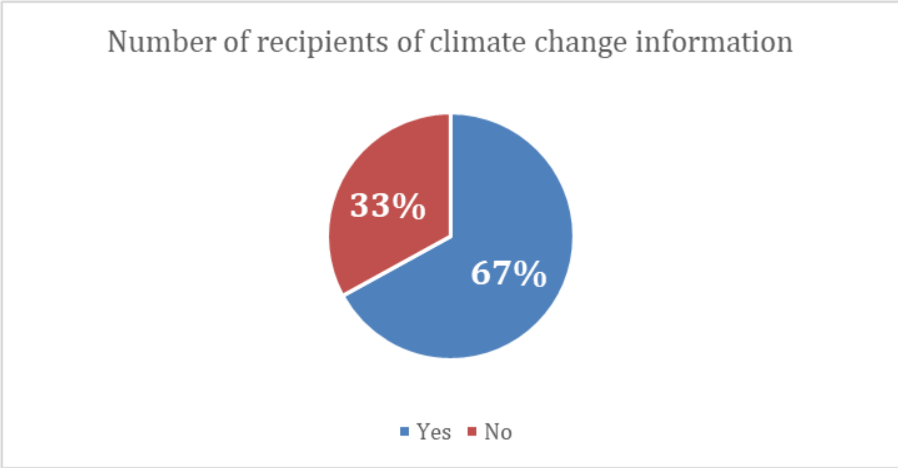

Figure 1. Number of climate change weather information recipients (Source: Primary Data, 2023)

The source of information on climate change of rice farmers in Trawas village (see **Figure 2**.) comes from newspapers 28.42%, extension workers 19.28%, internet 11.16%, and friends/relatives 9.14% According to Tarmana (2021), farmers who have access to climate change information will find it easier to adjust to climatic conditions in determining planting time These findings show that farmers rely on these four sources of information to understand and respond to climate phenomena. The role of the government is certainly needed by farmers because they have limited information resources to access more accurate information. Not only that, government climate policies such as providing facilities and infrastructure will greatly assist farmers in facing the challenges of climate change.

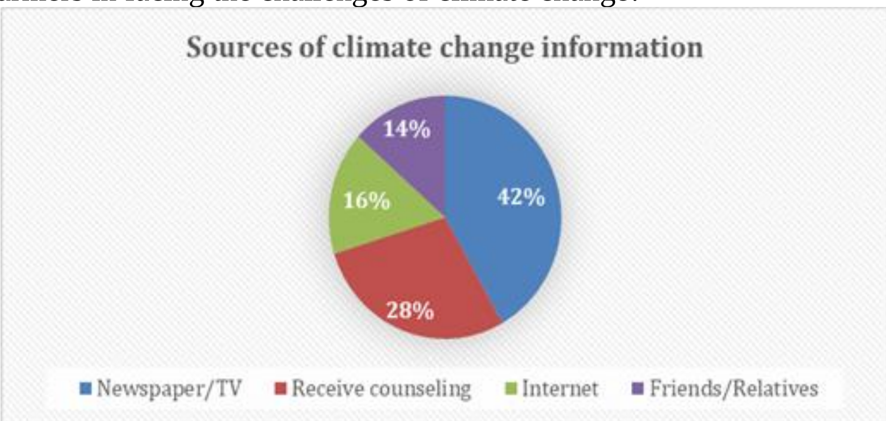

Figure 2. Primary data distribution of climate change information sources (Source: Primary Data, 2023)

Farmer Climate Change Perceptions

The threat of climate change has a real impact on rural rice farmers. Rural communities tend to rely on traditional knowledge in responding to climate change adaptation (Herminingsih &; Rokhani, 2023; Nurhayati et al., 2020). Climate trends may more influence perceptions than by the intensity of catastrophic events such as floods or droughts. Perceptions of climate change appear to be largely based on their experience with agricultural output (Bryan et al., 2013). Therefore, perceptions will probably influence how farmers react to the possibilities and threats posed by climate change. The specific reactions of their behavior to impacts will determine the process, likelihood of adaptation, and outcome of adaptation (Adger et al., 2009; Pauw, 2013). Smallholders need information

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about the consequences of climate change and how to respond to it in order to choose the best options to adapt (Karienye et al., 2019).

Table 2. Farmer perceptions of climate change

Farmers' Perceptions of Climate Change	Score	Criteria
Dry Season Rainfall	2,76	Changed a lot
Rainy Season Rainfall	2,64	Changed a lot
Temperatures	2,63	Changed a lot
Long Rainy Season	2,69	Changed a lot
Long dry season	2,46	Slightly changed
Pest and Disease Attacks	2,79	Changed a lot
Average	2,62	Changed a lot

Remarks: 1 = unchanged 2= slightly changed 3=changed a lot 4= changed greatly
Source: Primary Data, 2023

Table 3 proves that climate change is a threat perceived by farmers. Changes in rainfall patterns are most felt by rice farmers with a score of 2.76 (much changed). Interestingly, the average pattern of change scored 2.62 (much changed), meaning that this condition illustrates that climate change is real and can be felt by farmers. This is in accordance with the research of Karki et al., (2020), that climate change has been felt by farmers in almost all parts of the world such as rising temperatures, and reduced rainfall. As a result, farmers experienced a decrease in agricultural production. The perception and understanding of farmers determine the attitude to respond to this climate phenomenon. Furthermore, knowledge and experience will shape farmers' perceptions in the process of dealing with climate change (Nuraisah &; Budi Kusumo, 2019).

The Impact of Climate Change on Farmers

Increasing production costs due to rising production prices, climate change impacts forcing farmers to adapt to increasingly complex problems. The challenge of climate change is a factor that farmers must consider the impact on agricultural sustainability. The impact of climate change causes the natural balance to be disrupted such as changes in rainfall patterns, droughts and less water supply (Nuraisah and Kusumo, 2019). Ecosystem changes, floods, sea level rise, and droughts are negative impacts of climate change (Santos and Bakhshoudeh, 2021). Agricultural dependence on climate and weather conditions is a sector that is very vulnerable to the effects of climate change (Aggarwal, 2008). Climate change not only disrupts agricultural activities but also hinders farmers' economic growth (Ainurrohmah &; Sudarti, 2022).

In relation (see **Figure 3**) of the total respondents more than half of farmers are feeling the impacts of climate change. The most impact felt by farmers due to climate change is an increase in pest and disease attacks, while the lowest is an increase in production costs. This is in accordance with the research of Zheng, H., Huang, J., Zhuo, Y., & Xu, (2019), that climate change will adversely affect many humans and in particular, it is expected to result in floods, heat stress, and food insecurity, drought, and an increase in pests and diseases. Furthermore, Juroszek & Von Tiedemann (2013), that climate change can indirectly disrupt crop productivity through attacks by pests, weeds, pathogens and others that are enemies of plants.

Farmer Climate Change Adaptation Strategy

Responding to the threat of climate change requires a series of adaptation processes. The adaptation process includes adaptation strategies intended to minimize agricultural risks and ensure the sustainability of farmers. The commonly

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used farmer adaptation strategies are increasing crop diversity, changing planting patterns, and harvest periods, and reducing the length of the growing season (Nurhayati et al., 2020). Many adaptation practices available in various literature such as changing crop varieties, changing planting times, drought-resistant crops, crop diversification, soil and water conservation, improving irrigation, salinity, marinade, rain harvesting technology, reforestation, migration, and changing livelihoods are among the commonly used adaptation strategies (Aweke et al., 2020; Sari Yana et al., 2021). This is also in line with FAO's vision and mission (2013), that one way to know farmers practice adaptation is to develop plant varieties resistant to climate change, the use of biological fertilizers and biopesticides, changes in plant cultivars, planting time and cultivation techniques, reclamation of marginal land and degraded land. Based on previous references, researchers tried to ask several questions asked through questionnaires and interviews in exploring information related to climate change adaptation.

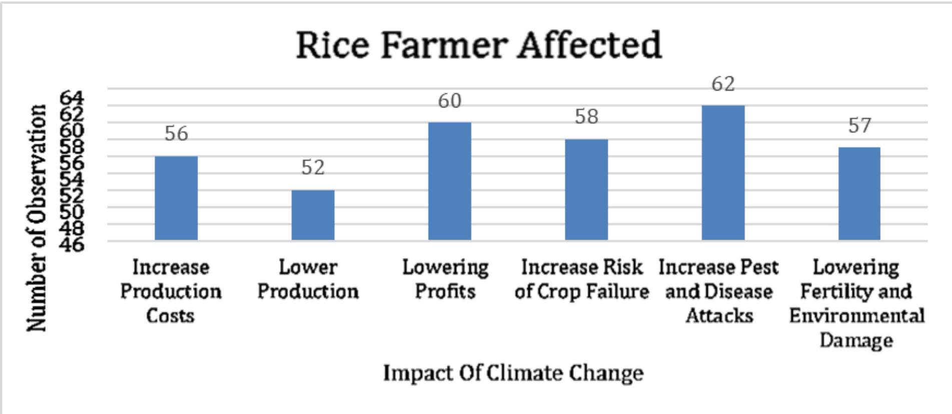

Figure 3. The impact of climate change on rice farmers (Source: Primary Data, 2023)

The results of the study (see **Figure 4**) found that the number of farmers who adapted (adaptor) to strategies such as changing planting patterns 56 people, changing varieties 67 people, changing fertilizer 59 people, improving soil conservation 53 people, and increasing irrigation 61 people. The most widely adopted adaptation strategy by farmers is to change varieties and the least is to improve soil conservation. Farmers prefer to change crop varieties due to erratic weather patterns resulting in crop failure. To minimize the risk of loss, farmers prefer to change varieties. The development of superior plant types and varieties can increase plant tolerance to abiotic environmental stresses such as rising air temperatures, drought, flooding/inundation and salinity, as well as resistance to biotic stresses (pests/diseases) (Widiarta, 2016).

Certain on the eve of the dry season. Meanwhile, the adoption of increased soil conservation is low because in the application of fertilizers and the eradication of pests and diseases, farmers still use many chemicals which are relatively easy and faster than the use of organic matter. This is by the research of Prajawahyudo et al., (2022), that the use of chemicals in agricultural practices in Indonesia is still relatively high. It is characterized by an increase in the use of chemicals nationwide. Furthermore, Marwantika, (2020) in the results of the study found that the use of chemical drugs by local farmers in agricultural practices is high and even not under the recommended use or excessive.

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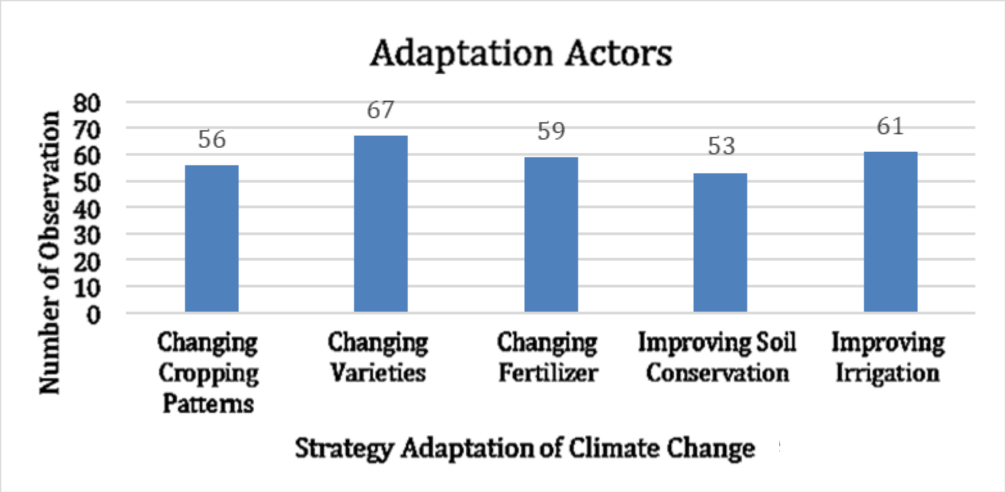

Figure 4. Number of adapters for climate change adaptation strategies for rice farmers (Source: Primary Data, 2023)

Factors Influencing Climate Change Adaptation Strategies

The adaptation process informs a number of series carried out by farmers to adapt. Whether farmers adapt or not is determined by the factors that influence climate change adaptation. The factors used (see **Table 3**) in this study include sociodemographics (age, education, occupation, land status, land area, and number of family members) and institutional factors (extension, farmer groups, and weather information). To analyze the factors that influence farmers' adaptation strategy decisions in this study using multivariate binary logistic regression. The multivariate binary dependent variables used are changing planting patterns, changing varieties, changing fertilizers, improving soil conservation, and increasing irrigation in accordance with recommended strategy standards (FAO, 2013). The results of Stata 14.2 data processing were then analyzed to determine the factors that influence the decision of rice farmers' adaptation strategy in **Table 3**.

Changing Cropping Patterns

Changing planting patterns is one of the adaptation strategies of rice farmers practiced by farmers. This adaptation strategy is intended to reduce production risks resulting from climate change. Erratic rainfall patterns require farmers to plant rice in certain seasons. In the dry season farmers tend to shift planting patterns, this is due to pest and disease attacks and more expensive production costs. Some rice farmers even reduce the portion of crops to face a high risk of crop failure. So that farmers plant more rice in the rainy season. The rainy season is considered a low-risk production season. One strategy to reduce the negative impacts of climate change can be done by changing crop patterns and densities (Malhi et al., 2021; Pampana et al., 2022)

Based on the results of logistic regression analysis (see **Table 3**). Factors that influence adaptation decisions to change cropping patterns are found that education, farming experience, having a side job, land status, extension and weather information have a positive and significant effect and land status has a positive but not significant effect on the decision to change planting patterns. This is in accordance with the research of Damayanti &; Laila (2022); Arsana &; Suastika (2018), that adaptation strategy decision factors are determined by experienced farmers and obtain extension workers more likely to adapt to climate change by adjusting planting schedules and patterns can reduce the impact of seasonal shifts and changes in rainfall patterns. If farmers impose normal planting patterns, they will risk crop failure and reduce rice

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production (Surmaini et al., 2017). While the factors of age, farmer groups, number of family members and land area have a negative and significant effect, this is due to the fact that many farmers in the research location are relatively old, low participation of family members, limited knowledge and activeness of farmer groups, the wider land in the research location tends to continue to carry out the same planting pattern and has limited resources.

Table 3. Factors influencing rice farmer adaptation decisions (n=100)

Variable	Changing Cropping Patterns	Changing Varieties	Changing Fertilizer	Improving Soil Conservation	Improving Irrigation
Age	-0.197*	0.396***	0.468***	0.043	-0.417***
Education	3.359***	0.970***	0.968**	-1.207***	0.054
Farming experience	0.241**	-0.114**	-0.299**	-0.264***	0.272***
Side job	4.054***	-0.738	0.102***	-2.318**	1.981**
Land status	1.552	2.133*	0.126	-2.866*	-0.121
Counseling	4.256**	0.316	1.451***	2.047*	3.045**
Farmer Group	-3.691**	0.513	0.873***	4.948***	0.627***
Weather Information	4.018***	3.239***	0.952	5.425***	6.017***
Number of Family Members	-0.369***	-0.083	3.587***	-0.167	1.681***
Land area	-0.000*	0.000*	-0.001***	-0.000*	0.001***
Log likelihood	-16.365	-34.807	-18.155	-24.287	-22.241
LR chi2(10)	85.86	68.97	102.28	86.03	94.11
Prob > chi2	0.00	0.00	0.00	0.00	0.00
Pseudo R2	0.72	0.50	0.74	0.6391	0.679

Remarks: significance *level *p<0.1, **p<0.05, ***p<0.01;* Source: Primary Data, 2023

Changing Varieties

Erratic weather patterns require farmers to change crop varieties in production. Rice farmers choose a strategy to change plant varieties by replacing rice plants with weather-resistant varieties. The use of this variety is usually applied when entering the dry season. Pest and disease attacks and higher production costs force farmers to adopt this strategy. Some high-yielding varieties are resistant to drought, inundation, pest and disease attacks, salinity that can be used such as amphibious varieties, silugonggo, genjah, hybrids and inbreds (Wihardja Ka et al., 2020). The results of logit regression show that age, education, land status and land area have a positive and significant effect on adaptation decisions to change plant varieties. This condition shows that the decision to change weather-resistant varieties is most likely owned by farmers (±55) years old, educated (±7) years more, have access to accurate weather information and more land. While farming experience, having a side job, and the number of family members have a negative and significant influence on the decision to change varieties. This is due to the relatively expensive use of weather-resistant varieties and higher production costs, so farmers who have large household economic dependents will tend not to adapt to replacing weather-resistant varieties. According to Indraningsih (2015), that farmers who have knowledge and skills as well as high access to information will utilize all available resources in responding

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to climate change such as the use of superior varieties.

Changing Fertilizer

Weather changes cause the fertility of rice plants to decrease. Changing fertilizer is one of the adaptation strategies for farmers to increase fertility and productivity of rice plants. The results of logit regression show that age, education, having a side job, counseling, farmer groups, number of family members, and land area have a positive and significant influence on the decision of adaptation strategies to change fertilizers. This shows that farmers with age (±55) more years, education (±7) More years, counseling, active in farmer groups, family members numbered (±3) persons and has a land area (±3722) (m^2) have a higher chance of implementing adaptation strategies to change fertilizers. Meanwhile, farming experience has a negative and significant influence on the decision of adaptation strategies to change fertilizers. This is due to farmers who are already accustomed to old practices and lack knowledge, skills and trust in the adoption of new agricultural practices. This is in accordance with research conducted by Rasmikayati &; Djuwendah (2015); Rudjua et al., (2024), that farmers' responses related to the impact of climate change influenced by the role of farmer groups in the community can affect the selection of appropriate fertilizers. The activity of farmer groups in the community influences climate change adaptation decisions (S. Angles, 2015)

Improving Soil Conservation

Rising air temperature can damage soil texture and fertility. Paying attention to and maintaining soil fertility is very important for plants. Soil becomes a planting medium that provides important nutrients for millions of microorganisms that greatly affect the health of rice plants. Improving soil conservation is equivalent to maintaining agricultural sustainability. Soil conservation serves to maintain soil health through practices and techniques. Threats to soil conservation according to the UN are climate change and traditional agricultural practices (Widiatningrum et al., 2023). To improve soil conservation, it can be done by irrigating and increasing biological agents (Pramulia, 2023) The results of logistic regression show that extension, farmer groups, and weather information have a positive and significant effect on adaptation strategy decisions to improve soil conservation. This shows that rice farmers who get counseling, have farmer groups, get weather information are more likely to improve soil conservation. Meanwhile, education, farming experience, side jobs, land status and land area negatively and significantly influence strategy decisions to improve soil conservation. This finding differs from Noor Zahrani's (2023), research, which found that age, education level, farming experience, household income, and number of family members affect soil conservation, while gender has no effect. This difference researchers found is that farmers in rural areas have limited knowledge, skills, and information related to soil conservation. The availability of extension workers, being active in farmer groups, and obtaining weather information provides greater opportunities in decisions on soil conservation adaptation strategies.

Improving Irrigation

Water is an important element in the production process to increase the productivity of rice plants. Water plays a role in the process of nutrient absorption, photosynthesis and the formation of rice plant tissue. The results of logistic regression show that age, farming experience, side jobs, extension services, farmer groups, weather information, number of family members and land area have a positive and significant effect on adaptation strategy decisions to improve irrigation. This shows that farmers who have an age (±55) years of farming experience (±30) years,

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have a side job, obtain counseling, are active in farmer groups, obtain weather information, number of family members (±3) people, and land area (±3722) m^2 have a greater opportunity to implement adaptation strategies to increase rice crop irrigation. Rasmikayati's research (2020) shows that farmers respond to climate change by adjusting the percentage of land area that needs irrigation and not. Furthermore, Indriastuti & Muktiali (2015), success in improving irrigation is determined by farmer cooperation, the role of family members, institutional factors such as extension services and farmer groups (m2).

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that: 1) The findings of this study conclude that most farmers have access to climate change information. Farmers' perceptions of climate change obtained that changes in rainfall in the dry season are most widely felt, these changes increase plant disrupting organisms, so farmers use more pesticides. 2) Based on the results of the logit regression, the researchers recommend strategies by paying attention to extension capacity, activeness in farmer groups and land area, because these factors have the most positive and significant influence on adaptation decisions of rice farmers. Increased extension capacity, activeness in farmer groups, having more land provides greater opportunities for rice farmers to increase knowledge and skills, information, production and income in responding to the impacts of climate change.

Based on the conclusions of the research results, the suggestions that can be given are that the government plays an important role for farmers, because farmers have limited capital resources in accessing more accurate information and access to technology. Not only that, climate policies from the government such as the provision of superior varieties that are drought and flood resistant, early warning, facilities and infrastructure will greatly help farmers in facing the challenges of climate change.

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