AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian
ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (3): 937-953, November 2024

PERCEPTIONS AND FACTORS INFLUENCING RICE FARMING ADAPTATION DECISIONS TO CLIMATE CHANGE THREATS IN TRAWAS VILLAGE, MOJOKERTO DISTRICT, EAST JAVA

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Submitted 13 May 2024; Approved 05 August 2024

ABSTRACT

Climate change is the phenomenon of changes in global temperature, seasonality and erratic rainfall that have an impact on human activities, changing people's lives, etc. The climate may threaten rice farming income. This research was conducted in Trawas village, Mojokerto district using survey method and purposive sampling using certain criteria. The data obtained were analyzed descriptively regarding perceptions and logistic regression to determine the factors that influence climate change adaptation practices undertaken by farmers. The results of the study based on farmers' perceptions show that 67% of rice farmers feel climate change such as changes in the rainy season (2.76), dry season and rainy season (2.64), air temperature (2.63), the length of the rainy season (2.69), pest and disease attacks (2.79), while the length of the dry season has changed slightly (2.46) with the biggest impact is the increase in pest and disease attacks in the longer rainy season. Socioeconomic factors that positively significantly influence climate change adaptation decisions are education, land status, counseling, and weather information, while the negative and significant effect is the number of family members. These findings imply that farmers, community organizations, and the government must be aware of climate change to reduce the impact of losses on the rice farming sector. Farmers will greatly benefit from the process of farmer adaptation, group involvement, and climate policies from the government such as the provision of drought and flood resistant cultivars, early warning systems, facilities and infrastructure such as improved extension, subsidized superior varieties, fertilizers, and pompanization.

Keywords: *adaptation strategies, climate change, perception, socio-economic*

BACKGROUND

Climate change is the rise in global temperatures brought on by human actions like burning fossil fuels and altering land usage (Buana et al., 2023). 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 is a phenomenon of global environmental issues that have occurred in various parts of the world. Climate change describes climatic conditions whose intensity tends to deviate from average conditions. This condition 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

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
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conversion and the use of fossil fuels (Supanggih & Widodo, 2013)

Greenhouse effect, one of the climate change terms often used to describe the continuous increase in anthropogenic greenhouse gases (human activities) and CO_2 concentrations in the atmosphere. As a result, the air temperature on the surface of the earth and in the lower atmosphere of the earth also rises. This increase triggers a rise in global temperatures, sea level rise in the lowest layers of the atmosphere and high rainfall fluctuations 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 recent 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. In 2018, the world was faced with 315 cases of natural disasters primarily related to climate, about 68.5 million people were affected, and economic losses amounted to $131.7 billion. where there are storms, forest fires, floods and droughts by 93% (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 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 & 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 are not 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 which 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, decreased productivity, 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

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soybeans. Of the three types of food crops, rice is a food consumed by about 90% of the total population. Over the past 10 years, the volume of rice consumption has tended to increase between 0.13% and 5.7%. 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 Indonesia 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 Indonesians has increased since the pandemic. In 2018, the average consumption of all types of rice, including local rice, superior quality rice, and imported rice was 1,404 kg per capita per week. This figure then dropped to 1,374 kg per capita per week in 2019. However, when the pandemic hit, the average consumption increased to 1,379 kg per capita per week. The consumption also continued to increase in the second year of the pandemic, to 1,451 kg per capita per week in 2021 (BPS, 2022).

Climate change is vulnerable to the agricultural sector threatening one of the rice producing areas in East Java is Mojokerto Regency, Trawas Sub-district, Trawas Village. The impact of climate change was marked in the last four years of 2019-2022 where the harvest area decreased from 54,993 hectares to 49,281.71 hectares and rice production from 339.8 thousand tons fell to 287.2 thousand tons (BPS, 2023). As one of the rice producers, Trawas village, Mojokerto district shows a potentially serious threat from climate change to the decline of food self-sufficiency in the last four years. Based on preliminary studies at the research site, farmers consider that climate carrying capacity is very influential on rice production. Climate changes such as changes in rainfall and drought patterns, long dry seasons and pest and disease attacks are widely felt by farmers. These changes make it difficult for farmers to determine the effective planting and harvesting period, this has an impact on failure and a decrease in the quality of rice production so that farmers' income also decreases.

Although many previous studies have examined climate change, there are still few references that examine the factors that influence climate change adaptation decisions from a socio-economic perspective. Identification as a follow-up to the case requires a study in a different perspective, especially the study of climate change aspects. Therefore, to identify these problems, researchers asked several questions, among others: What are the perceptions of rice farmers in addressing climate change and what are the socio-economic factors that influence rice farmers' decisions in implementing climate change adaptation strategies in Trawas, Mojokerto District, East Java.

RESEARCH 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 are being 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. Survey method was used in sampling. The sampling technique used Lemeshow's formula to obtain a total of 100 samples. This research was conducted in August 2023.

The data sources of this research are primary and secondary data. Primary data were obtained from observation, interviews assisted by questionnaires, while secondary data were obtained from relevant agencies such as the Department of Agriculture and the Central Bureau of Statistics. The

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data obtained were analyzed descriptively to obtain an overview of farmers' perceptions of climate change. Descriptive analysis can be used when researchers describe sample data, and do not want to draw conclusions that apply to the population from the use of samples (Sugiyono, 2018).

Meanwhile, to determine the socio-economic factors that influence farmers' adaptation decisions using binary logistic regression. Farmers' decisions to implement adaptation strategies to climate change measured are changing cropping patterns, varieties, fertilizers, improving soil conservation, and irrigation. Adaptation and non-adaptation categories are based on the results of the average score obtained by respondents (Field, 2015). Measurement of climate change adaptation decisions as follows.

1. Likert scale:
   a. 1 : Never
   b. 2 : Just this time
   c. 3 : Has been running for almost a year
   d. 4 : Doing it every year
2. Mean = Σx_i / n
   a. Σ (sigma) represents the sum of all values.
   b. x_i represents each individual value in the data set.
   c. n represents the total number of values in the data set.
3. Category:
   a. If Individual Score ≥ Mean then it is worth "1" (Adaptive)
   b. If the Individual Score < Mean then it is worth "0" (Less/Not Adaptive)

The categorization of adaptation and non-adaptation is based on the average score obtained by farmers. This measurement is intended to explain the level of seriousness of farmers in adapting based on the average score. Where, if the farmer gets a score value ≥ average means that the farmer is serious in adapting, and if the farmer gets a score value < average means that the farmer is not serious in adapting. 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) as follows:

$$f(yi) = \pi^{yi} (1- \pi i) ^ {(1-yi)}$$

Information:

1. πi = probability of i-th occurrence
2. yi = i-th random variable consisting of 0 and 1

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

$$\pi (x) = (\exp(\beta 0+\beta 1x)) / (1+\exp(\beta 0+\beta 1x))$$

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:

$$g(x) = \ln[(\pi(x))/(1-\pi(x))] = \beta\_0 + \beta\_1 X$$

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RESULT AND DISCUSSION

Climate change has serious impacts that affect rice farming activities such as changes in rainfall patterns, temperature increases, pest and disease attacks are widely felt by rice farmers in Trawas Village. They recognize that the erratic changes in the rainy and dry seasons make it difficult for rice farmers to determine the optimal planting and harvesting period. Drought, flooding, and pest attacks are the real impacts felt by rice farmers. As a result, rice fields lack water, plants are flooded, attacks of plant pest organisms (OPT) increase which has an impact on reducing the quality of production in the drought season and crop failure during floods and pest and disease attacks. According to Shrestha et al. (2017), most farmers are experiencing higher temperatures and heat waves, which can lead to longer droughts in the dry season, greater variability in the rainy season, and shorter growing seasons with higher levels of uncertainty and shorter duration of rainfall than before. Climate change puts pressure on rice plants causing production to decline (Shinta, 2021). To further examine the amount of 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 (getting extension workers, farmer groups, weather information). An overview of the socio-economic characteristics of farmer households will help in understanding farmers' adaptation behavior.

Table 1. Descriptive Statistical Analysis

Household Characteristics			
Variable	**Indicators**	**Mean**	**Std. Dev.**
Age	Farmer Age (Years)	54.15	9.543.494
Education	Duration of Education (Years)	7.33	2.141.721
Farming experience	Length of Farming (Years)	29.79	1.319.113
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	4.848.406
Institutional Factors			
Variable	**Indicators**	**Mean**	**Std. Dev.**
Counseling	Dummy, 1=Obtaning 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, the average age of farmers is 54 years, 7 years of education, 30 years of farming experience, the number of families of 3 people, side jobs. worth 1 (1 = have a side job), land status worth 1 (1 = own), land area 3772, while on the institutional factor of extension worth 1 (1 = get extension), Farmer Group worth 1 (1 = active), weather information worth 1 (1 = get weather information). These results indicate that farmers have a smaller chance of adapting when

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viewed from the characteristics of age, education, length of farming, and having a side job. Higher age, lower education, less experience, more than 20 years of farming and having a side job could potentially prevent farmers from being creative and innovating to respond to the threat of climate change. Not only that, efforts to change the attitudes and behavior of rice farmers from conventional to modern agricultural practices will be difficult. According to Barnes, al., (2020), farmer characteristics play an important role regarding flexibility in determining strategies. Education and experience affect the way individuals respond to change, while institutional factors, such as organizations, social construction, and the environment in viewing 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 figure 2 the number of recipients of climate change information is 67% receiving information and 33% receiving no information. This shows that more than half of the respondents studied received climate change information. Thus, respondents know and feel climate change.

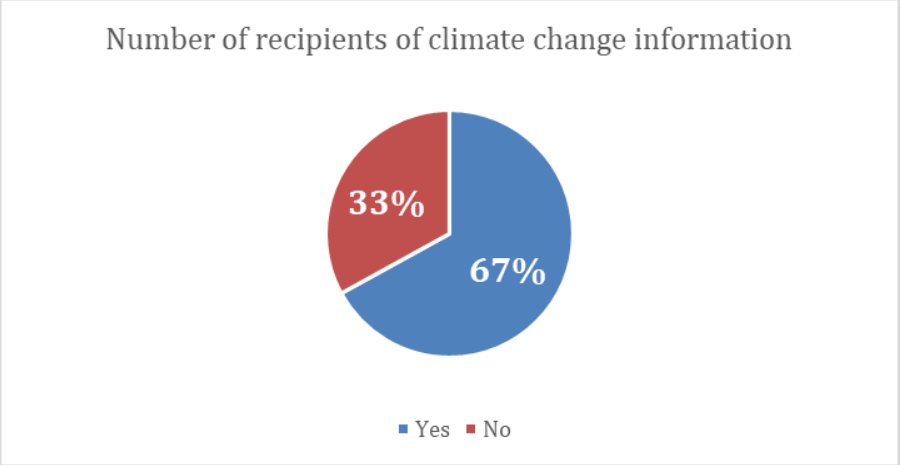

Figure 1. Number of Climate Change Weather Information Recipients
Source: Primary Data (2023)

A total of 67% answered yes, meaning that farmers acknowledged receiving climate change information and 33% answered no, meaning that farmers did not receive climate change information. Farmers who receive information will increase the chances of adapting to the threat of climate change compared to those who do not receive information. The availability of information is an important asset for farmers to follow up on any possibilities that will occur. Sources of information on climate change for rice farmers in Trawas Village (see Figure 2) come from newspapers 28.42%, extension workers 19.28%, internet 11.16%, and friends/relatives 9.14%. Most farmers do not access information all the time, only during free time and meetings with community groups. However, it was found that not all farmers were able to utilize climate change information to adapt. This finding shows 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 farmers have limited sources of information in accessing more accurate information. Not only that, government climate policies such as the provision of facilities and infrastructure will greatly assist farmers in facing the challenges of climate change.

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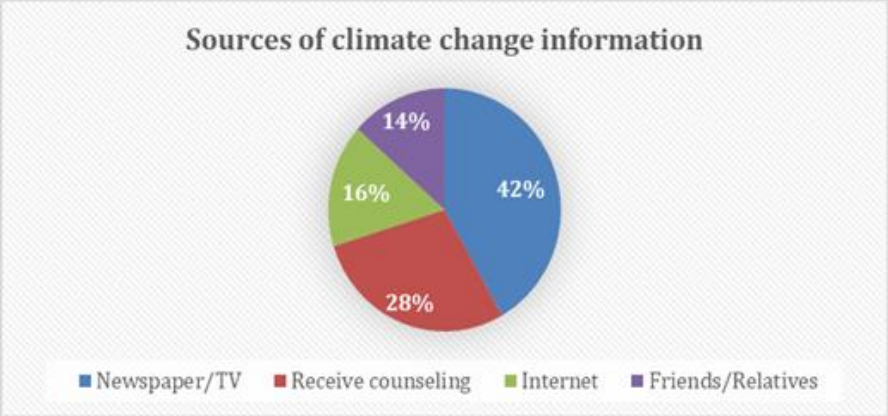

Figure 2. Primary Data Distribution of Climate Change Information Sources
Source: Primary Data (2023)

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, 2014; Nurhayati et al., 2020). Perceptions may be more influenced by climate trends 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 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)

There are two seasons in the tropical wet and dry climate (Aw) in Trawas Village, namely the dry season and the rainy season. The driest month is August, and the dry season runs from May to October. Meanwhile, the region experiences the rainy season from November to April. January is the wettest month with monthly rainfall exceeding 300 mm. Trawas village experiences 80-140 rainy days annually, with annual rainfall of 1,300-1,900 mm (Mojokerto District Government, 2019). Table 3 proves that climate change is a threat perceived by farmers. The changes are evidenced by farmers' perceptions related to changes in rainfall patterns with scores of 2.76 (much changed), 2.64 (much

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changed), 2.63 (much changed), 2.69 (much changed), 2.49 (little changed) 2.49 (little changed). Interestingly, the average pattern of change scored 2.62 (much change), meaning that this condition illustrates that climate change is real and can be felt by farmers. Farmers admit that these changes have been felt since the last ten years. Previously, it was still easy for farmers to determine the planting period and the harvest success rate was still higher than in the last 10 years. The changing weather patterns have forced farmers to be more adaptive and increased production risks such as pest attacks, floods, landslides and so on. These conditions also increase the risk of crop failure and reduced crop quality. Whereas in slightly changing conditions only require low adaptation and relatively small production risks. 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 increasing temperatures, and reduced rainfall. As a result, farmers experienced a decrease in agricultural production. Farmers' perceptions and understanding determine their attitude towards this climate phenomenon. Furthermore, knowledge and experience will shape farmers' perceptions in the process of dealing with climate change (Nuraisah & 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 considering 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 & Kusumo, 2019). Ecosystem changes, floods, sea level rise, and droughts are negative impacts of climate change (Santos & 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).

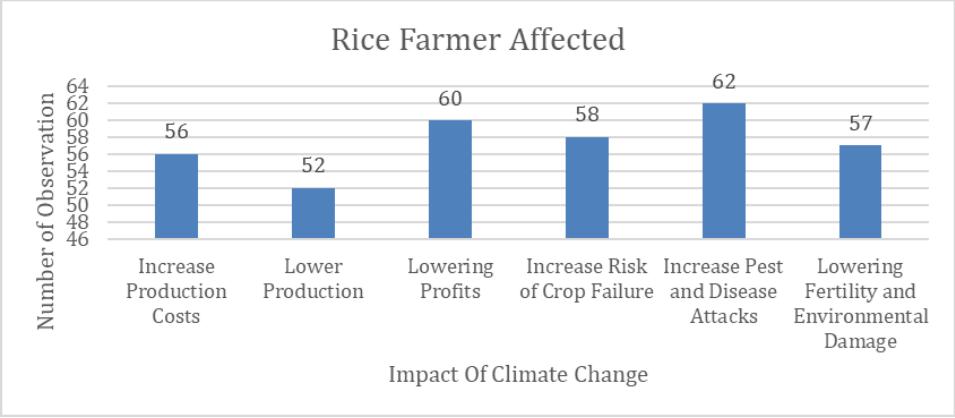

Figure 3. The Impact of Climate Change on Rice Farmers
Source: Primary Data (2023)

Related from the total respondents that more than half of the farmers felt the impact of climate change. The impact of climate change on increased costs by 56 people, decreased production by 52 people, decreased profits by 60 people, increased risk of crop failure by 58 people, increased pest and disease attacks by 62 people, and decreased fertility and environmental damage by 57 people. The most impact felt by farmers due to climate change is an increase in pest and disease attacks, while the

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lowest impact is an increase in production costs. Increased pest and disease attacks cause damage to rice plants, reduced yields, and excessive use of pesticides. Based on the interview results from key informants, they felt an increase in pest and disease attacks during the rainy season. The rapid proliferation of pests and diseases is difficult for farmers to control. So that farmers are forced to use pesticides, but not a few farmers use pesticides not in accordance with the recommended dosage which has the potential to damage the surrounding environment such as soil texture, natural nutrients and so on. As a result, farmers not only experience financial losses from production but also threaten the sustainability of rice farming. This is in accordance with the research of Zheng et al. (2019), that climate change will adversely affect many humans and in particular is expected to result in flooding, heat stress, and food insecurity, drought, and increased pests and diseases. Furthermore, Juroszek & Von Tiedemann (2013), that climate change can indirectly disrupt crop productivity through the attack of pests, weeds, pathogens and others that become 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 and sustainability of farmers. There are several adaptation strategies carried out by rice farmers in Trawas village, among others; changing cropping patterns, changing varieties, changing fertilizers, increasing irrigation, and improving soil conservation. To respond to extreme weather farmers make adaptations such as improving irrigation systems and saving water use, making water drainage channels around rice fields and regular water management. In erratic weather patterns, farmers plant at the beginning of the season, and change fertilizers and do tillage with organic materials. While anticipating pest and disease attacks, rice farmers adapt to the use of bio-pesticides, weed management, and dispose of pests around rice plants, changing crop rotations interspersed with secondary crops such as chayote, long beans, cucumbers and so on.

The results of the study obtained the number of farmers who adapted to strategies such as changes in cropping patterns 56 people, changes in varieties 67 people, replacement of fertilizers 59 people, improved soil conservation 53 people, and increased irrigation. 61 people. The most adaptation strategy carried out 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 that result in crop failure. To minimize the risk of loss, farmers prefer to change varieties. Meanwhile, the adoption of improved soil conservation is still low because in applying fertilizers and eradicating pests and diseases, farmers still use a lot of chemicals that are relatively easy and fast compared to the use of organic materials. This is in accordance with the research of Prajawahyudo et al. (2022), that the use of chemicals in agricultural practices in Indonesia is still relatively high. This is characterized by the increasing use of chemicals nationally. Furthermore, Marwantika, (2020) in his research found that the use of chemical drugs by local farmers in agricultural practices is still high and even not in accordance with the recommended use or excessive. Common adaptation strategies used by farmers are increasing crop diversity, changing cropping patterns, harvesting periods, and shortening the length of the growing season (Nurhayati et al., 2020).

Many adaptation practices are available in various literatures such as changes in crop varieties, changes in planting time, drought-resistant crops, crop diversification, soil and water conservation, increased irrigation, salinity, marinade, rain harvesting technology, reforestation, migration, and livelihood changes. commonly used adaptation strategies (Aweke et al., 2020; Yana et al., 2021).

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This is also in line with the vision and mission of FAO (2013), that one way of knowing farmers to adapt is to develop crop varieties that are resistant to climate change, the use of biological fertilizers and biopesticides, changes in crop cultivars, planting time and cultivation techniques, reclamation of marginal land and degraded land. Based on previous references, researchers tried to ask several questions through questionnaires and interviews in digging up information related to climate change adaptation.

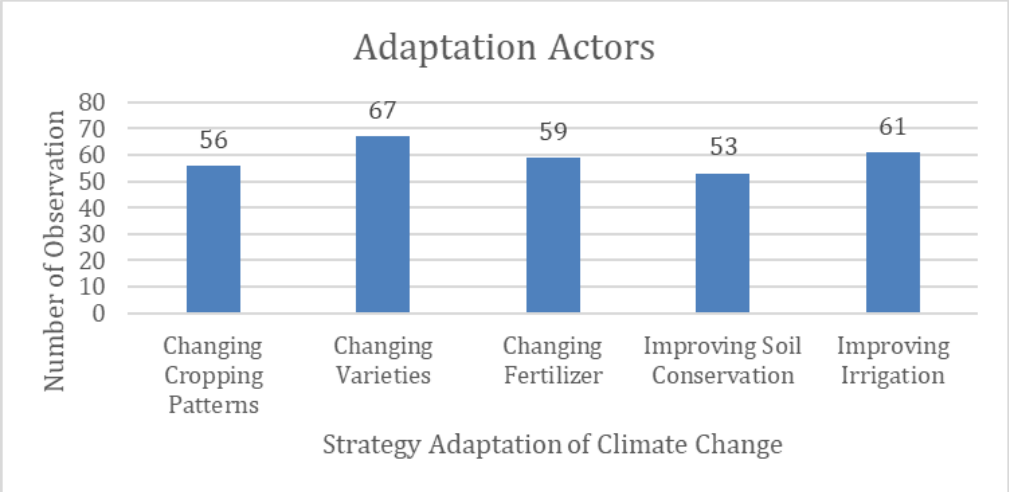

Figure 4. Number of Adapters for Climate Change Adaptation Strategies for Rice Farmers
Source: Primary Data (2023)

Factors Influencing Climate Change Adaptation Strategies

Adaptation decisions made by rice farmers are influenced by many complex variables. Previous studies conducted by Kristanti (2018), showed that several factors, such as the level of education and skills of farmers, the area of land that failed to harvest, the area of land cultivated, and access to credit, strongly influence farmers' decisions to adapt to climate change. Analysis of the factors influencing rice farmers' adaptation decisions is essential to improve farmers' ability to deal with climate change and increase yields because these factors influence farmers' decisions in implementing effective adaptation strategies to deal with climate change. Logit regression analysis in this study was conducted to determine the factors that influence the decision of adaptation strategies of rice farmers. Climate change adaptation strategies used are changing cropping patterns, varieties, fertilizers, improving soil conservation and irrigation. The dependent variable used is the decision to do climate change adaptation strategies (binary, 1 = adaptation, 0 = no adaptation), where the number 1 = adaptation is obtained if the value of the farmer's score ≥ the average score, and the number 0 = less or no adaptation is obtained if the value of the farmer's score < the average score. While the independent variable used is the characteristics of respondents.

ISSN 2580-0566; E-ISSN 2621-9778
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Table 3. Socio-economic Factors Influencing Adaptation Decisions of Rice Farmers (n=100)

Variabel	Marginal Effect	Coef.	Std. Err.
Age	.0061969	.0907333	.0723207
Education	.0564542***	.8265837***	.3459413
Farming Experience	.0016221	.0237498	.0582377
Side Job (dummy)	.1024193	.149959	.1112005
Land Status (dummy)	.1372784**	.2009985**	.1048585
Counseling (dummy)	.5893505***	.8629076***	.2376482
Weather Information (dummy)	.2329404**	.3410636**	.1248191
Number of Family Members	-.2013579***	-.2948216***	.8971065
Land Area	.0000112	.0001644	.0001234
_Cons		-1348097	5518535
Log likelihood		-21.323349	
LR chi2		90.17	
Prob > chi2		0.0000	
Pseudo R2		0.6789	

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

Furthermore, the partial significance test of socioeconomic factors on climate change adaptation decisions using the Wald test can be seen in Table 4. Of the nine independent variables included in the capital, the factors that have a significant effect on adaptation decisions are education, land status, counseling, weather information, and the number of family members, while other factors such as age, farming experience, and side jobs have no significant effect on climate change adaptation decisions.

Education

Farmers' education variable measured is the length of education taken in units of years has a significant and positive value on the adaptation decisions of farmers. The coefficient value of education level variable is 0.826 which means that farmers with higher education have a greater chance of implementing climate change adaptation strategies. While the value of the marginal effect obtained 0.564, which means that every one-year increase in farmer education will increase the chances of implementing climate change adaptation strategies by 56%. This result indicates that farmer education as an investment helps farmers in adopting various adaptation strategies. The results of this study are in accordance with research by Azis (2021), that education has a positive effect on climate change adaptation, with higher education farmers more easily adopt and understand various adaptation strategies such as the use of varieties, changes in cropping patterns, and agricultural diversification. Hidayat (2023) also found that education affects climate change adaptation. Increased education helps farmers in accessing knowledge, skills and awareness of farmers in the adoption of agricultural practices that reduce the risk of climate change. According to Rosyida et al. (2021), low-educated farmers have limited knowledge, skills, productivity, low income will hinder farmers in adapting and adopting innovations and technologies.

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Land Status

Land status is measured by 2 categories, namely 1 = owned, 0 = not owned, the land status variable has a significant and positive effect on farmers' adaptation decisions. The coefficient value of the land status variable is 0.200 that the ownership of land status that is self-owned (table 3) has a greater chance of implementing climate change adaptation strategies. While the marginal effect value obtained is 0.137, which means that any change in the ownership status of farmers will increase the chances of implementing climate change adaptation strategies by 82%. Based on the results of data processing characteristics of respondents that rice farmers' land status is self-owned. Owned land status will reduce production costs for farmers. These findings are in accordance with those conducted by Damascena (2023), that land ownership status has a positive effect on climate change adaptation. Land status is one of the considerations of farmers' costs related to climate change adaptation decisions. Owned land status, rent and profit sharing have differences in terms of costs. Rental and profit-sharing land status will certainly increase agricultural costs, so that revenue will be less than self-owned.

Counseling

Counseling is measured by a dummy variable indicating that farmers get or do not get counseling. Counseling variables have a significant and positive effect on farmers' adaptation decisions. The coefficient value of the counseling variable is 0.862 that the availability of counseling has a greater chance of implementing climate change adaptation strategies. While the marginal effect value obtained is 0.589 which means that the more intense counseling to farmers will increase the chances of implementing climate change adaptation strategies by 58%. The role of counseling agents encourages farmers to increase their chances of adapting to climate change in the research location. Programs on tillage techniques, irrigation, cultivation, organic fertilizer processing and biopesticides are very helpful for farmers to adapt.

However, at the time of the interview some farmers admitted that the extension assistance program was very helpful for farmers to increase the productivity of rice farming but the assistance activities were still not maximized at the stage of climate change adaptation practices. So that farmers only get information about climate change and adaptation strategies, but to get to the implementation stage of farmers is still not optimal due to limited costs and supporting technology. According to research by Mardiyati & Arifin (2024), that counseling has a positive effect on climate change adaptation decisions of rice farmers. Extension increases farmers' literacy related to climate change adaptation knowledge and understanding of farmers in the adoption of appropriate strategies to reduce risk. Thoai et al. (2018) also suggested that extension is a positive and significant factor in influencing farmers to adapt to climate change. However, due to limited costs and access to technology, farmers are not maximized in adapting to climate change.

Weather Information

Weather information is measured by a dummy variable indicating whether or not farmers obtain weather information. Weather information variable has a significant and positive effect on farmers' adaptation decisions. The coefficient value of weather information variable is 0.341 that the availability of weather information has a greater chance of implementing climate change adaptation strategies. While the marginal effect value obtained is 0.23, which means that the more weather information obtained by farmers will increase the chance of implementing climate change adaptation

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strategies by 23%. Information is very important for each individual in learning something that can be obtained from the surrounding environment. These results are in accordance with research conducted by Abid et al. (2016) and Priyanto (2017), that weather information significantly influences positively on farmers' decisions in implementing climate change adaptation strategies. Damascena (2023) also suggested that the variable access to weather information affects farmers' decisions in adapting to climate change.

The Number of Family Members

The number of family members is measured by the number of family members of farmers. The variable number of family members has a significant and negative effect on farmers' adaptation decisions. The coefficient value of the variable number of family members is -0.294 that the number of family members increases the opportunity to implement climate change adaptation strategies. While the marginal effect value obtained was -0.201 which means that the more family members of farmers will reduce the chances of implementing climate change adaptation strategies by 20%. This finding indicates that the number of family members will be a consideration for farmers in implementing adaptation strategies. This can be caused by various factors such as education, greater economic dependents allow farmers to seek more alternative and profitable jobs. Researchers can interpret the number of family members based on the characteristics of respondents that low education and the majority have side jobs in the family are the reasons why farmers are reluctant to adapt. Economic reasons for basic needs such as children's education, health and so on become more important for farmers than adaptation to rice farming. Limited knowledge, skills and economic dependents hinder farmers in responding to climate change.

These findings are in accordance the research of Priyanto (2017); Abid et al. (2016) and Angles et al. (2015), the number of family dependents reduces the opportunity for farmers to implement climate change adaptation strategies. However, Damascena (2023) stated that the variable number of dependents or family members affects farmers' decisions to adapt to climate change. The reason why the number of family members does not have a significant effect is that farmers in the research location do not really involve the family in their farming activities so that this factor does not affect the farmers' decision to implement climate change adaptation strategies. This opinion is in accordance with research conducted by Schneider et al. (2016), climate change adaptation decisions are not influenced by the number of family members because family members are not involved in rice farming activities and farmers prefer to hire labor from outside the family who are more experienced.

CONCLUSION AND SUGGESTION

Based on the results of the research that has been done, it can be concluded that:

1. The findings of this study concluded that the number of recipients of climate change information at 67% means that more than half of respondents know and feel climate change. Farmers' weather information is sourced from newspapers/TV 42%, extension workers 28%, internet 16%, and friends/relatives 14%, which shows that farmers rely on these four sources of information as information material to understand and respond to climate phenomena. The perception of farmers obtained climate change with many categories changing in dry and rainy season rainfall, air temperature, rainy season length, pest and disease attacks, while the length of the dry season

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changed slightly. The impact of climate change that is most felt by farmers is the attack of pests and diseases that occur in the longer rainy season and cause rice to be flooded.

2. Based on logit regression results, Factors that have a positive and significant effect on farmers' adaptation decisions are education, land status, counseling and weather information, while those that have a negative and significant effect are the number of family members.

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 such as improved extension services, subsidized high-yielding varieties, fertilizers, and pompanization.

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