Adaptation capacity of corn farmer’s to climate change: a case study in Pringsewu District, Lampung Province

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Adaptation capacity of corn farmer's to climate change: a case study in Pringsewu District, Lampung Province

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Abstract. Climate change has become a global phenomenon and impacts the sustainability of farming. Farmers are required to have the knowledge and capacity to deal with climate change. This study aims to analyze the level of adaptation capacity of farmers to climate change and the factors that affect the level of adaptation capacity of farmers to climate change. The research was conducted on corn farming in Pringsewu Regency, Lampung, from April to May 2022. The respondents were 30 farmers, and the data were analyzed using a qualitative approach. The results showed that farmers' knowledge level in the research location on climate change is still low. Only 40% of farmers know about predicting climate change, and 46.67% are aware of accessible sources related to climate change. Farmers' knowledge of other aspects of climate change (Forms of climate change, adaptation, and impact of climate change) was 53.33%, 63.33%, and 66.67%, respectively. Of the eight adaptation indicators, two are classified as high: the use of improved varieties and adjustment of planting time. Two indicators are categorized as medium, namely soil cultivation, and organic fertilizers, and four indicators are classified in the low category.

1. Introduction

Climate change has become a severe problem for the whole world. Data from the Intergovernmental Panel on Climate Change [1] shows that since 1850, there have been 12 hottest years based on global surface temperature data. Eleven of the 12 hottest years occurred in the last 12 years. The total temperature increase from 1850-1899 to 2001-2005 reached 0.76 Celsius [2]. Climate change has impacted fluctuations in rainfall, shifts in the rainy season and planting season, and floods [3]. In addition, climate change also impacts rising sea surface temperatures, extreme weather intensity, rainfall patterns, and large waves [4].

Agriculture is the sector most vulnerable to climate change [5]. Climate change has caused decrease in rainfall intensity which directly impacts farming, especially rainfed farming [6]. Every temperature increase of at least 1 degree Celsius will reduce rice yields by 10%, and an increase in temperature of 1 degree Celsius will reduce the production of other crops by 5-7% [7]. The decrease was due to reduced sink formation, shorter growth period, and increased respiration [8]. Climate change also causes air temperature and humidity, which will trigger the growth and development of plant-disturbing organisms, which in turn causes a decrease in farmer productivity and income [9].

Agriculture is an important sector of the Indonesian economy [10] because most of the Indonesian population primarily works in the agricultural sector [11]. The Central Statistics Agency (BPS) in 2021 stated that the number of Indonesians working in the agricultural sector was 38.23 million, or around

29.76% [12]. Therefore, a decline in agricultural production can potentially reduce the welfare of the majority of Indonesia's population. It is interesting to study that climate change has been proven to reduce agricultural yields [13]. Therefore, mitigation is needed to prevent the decline in agricultural yields due to climate change [14]. Unfortunately, currently, many farmers do not know about the phenomenon of climate change and have not mitigated climate change.

This research focuses on corn farming in Pringsewu Regency, the center of corn in Lampung Province. Corn commodity was chosen as the object of research because corn is grown on non-irrigated rainfed land, dependent on rainwater. Hence, climate change significantly impacts the sustainability of this farming. This research focuses on aspects of knowledge, and the level of adaptation carried out by farmers due to climate change. This study aims to analyze the level of knowledge and adaptation capacity of corn farmers to climate change in Pringsewu Regency, Lampung Province.

2. Material and methods

The research was designed with a descriptive survey approach in the Pekon Enggalrejo area, Adiluwih District, Pringsewu Regency. Descriptive survey research is used to describe the population being studied. In the survey method, the research sample is taken from the farmer population at the research location through interviews using a questionnaire [15]. The location was chosen deliberately because it is a corn farming center with a large corn plantation area and is affected by climate change. The study was conducted between April and May 2022.

According to BPS data, the total population in Pekon Enggalrejo is 1403 people, with a farmer household population of 456 households [16]. Therefore, the sample size was set at 30 people who were drawn using a simple random technique. The sample was chosen based on Mahmud's theory, which states that the minimum sample size for research using statistical data analysis is 30. In order to describe the degree of awareness and adaptation of farmers to climate change, the number of samples is therefore thought to be representative of the population.

This research was used the primary and secondary data. The secondary data were the two types of information used in this investigation. Secondary data was gathered from reports, journals, and studies associated with this research, while primary data was gathered through structured interviews using a questionnaire instrument. In addition to collecting data through questionnaires, field observations were carried out to support the accuracy and depth of the research data. The qualitative descriptive method of data analysis was used to explain the degree of knowledge and climate change adaptation of farmers using a Likert scale. The Likert scale is used to analyze a person's or a group of people's attitudes, views, and perceptions of social issues [17] and uses several questions to measure individual behavior by responding to 5 choice points on each question item, strongly agree, agree, disagree, disagree, and strongly disagree [18].

3. Results and discussion

3.1. Respondents' characteristics

Respondents were dominated by farmers aged 41-60 years, with 18 farmers (60%) and the rest in the range of 20-40 years and above 60 years (40%) (See Table 1). This age group belongs to the productive age group and can manage farming activities optimally. At a formative age, in general, a person may want to improve skills and increase knowledge and farming capacity [19]. Based on gender, respondent farmers were dominated by the male sex, with as many as 24 farmers (80%) and female respondents six farmers (20%)

Primary school graduates make up the majority of farmers' educational backgrounds, accounting for 12 farmers (or 40%), and junior high school graduates, with as many as eight farmers (26.67%). In addition, seven farmers did not complete formal education (23.33%). The level of education correlates with the level of ability and explores farmers' level of understanding about everything, increasing knowledge and skills and changing farmers' attitudes [20]. Therefore, farmer education becomes the capital in increasing the knowledge and ability farmers to adapt to climate change. Most of the farmers

have over ten years of farming experience, with 26 farmers (86%) and farmers who have farming experience between 1-10 years, only as many as four years (13.33%). The respondents' characteristics of corn farmers are shown in Table 1.

Table 1. Characteristics of respondents

No	Variable	Number of Respondents (n)	Percentage (%)
1	Age (year)		
	20-30	4	13.33
	31-40	5	16.33
	41-50	8	26.67
	51-60	10	33.33
	>60	3	10.00
2.	Gender		
	Men	24	80.00
	Women	6	20.00
3.	Level of Education		
	No formal education background	7	23.33
	Elementary School (*Sekolah Dasar*)	12	40.00
	Junior High School (*Sekolah Menengah Pertama)*	8	26.67
	Senior High School (*Sekolah Menengah Atas*)	3	10.00
	Bachelor or Diploma Degree	-	-
4.	Farming Experience (year)		
	1-10	4	13.33
	11-20	8	26.67
	21-30	11	36.67
	>30	7	23.33

Source : Primary Data (2022)

3.2. Farmers' knowledge of climate change

Farmers have limited knowledge of climate change (Table 2). Of all respondents, the climate change knowledge is in the range of 40% to 70%. Only 40% of farmers have the knowledge predicting climate change. The farmers' ability to predict climate change is still low, and they have limitations in obtaining information related to climate change. Only 46.67% of farmers are aware of accessible resources related to climate change. The results of this study illustrate that the sources that are easily accessible to farmers in increasing understanding of climate change are still low.

Table 2. Farmers' level of knowledge on climate change

No	Indicator/Knowledge	Yes (%)	No (%)
1	Understanding of climate change	70.00	30.0
2	Sources of climate change information	46.67	53.33
3	Impact of climate change	66.67	33.33
4	Forms of climate change	53.33	46.67
5	Predicting climate change	40.00	60.00
6	Climate change adaptation	63.33	36.67

Source : Primary Data (2022)

Furthermore, farmers' knowledge of other aspects of climate change (Climate change forms, adaptation to climate change, and climate change effects) was 53.33%, 63.33%, and 66.67%, respectively. Overall, farmers' knowledge level in the research location on climate change is still low. It takes hard work from various parties to increase farmers' understanding of climate change. Good knowledge can encourage farmers to anticipate reduce the negative effects of climate change on agriculture especially on corn farming. Farmers who know about climate change will act reactively and

predict the effects that occur as a result of climate change [21]. So, efforts to increase farmers' understanding of climate change must be carried out continuously.

3.3. Climate change adaptation by farmers

Corn farmers have limited knowledge of climate change, but that does not mean farmers do not implement efforts and mitigation of climate change (Table 3). However, farmers do not understand well that adaptation is an attempt to lessen the effects of climate change. Therefore, adaptation and mitigation of farmers to climate change significantly minimize the potential for decreased production and crop failure. The term "adaptation to climate change" describes modifications made to natural by human systems in response to present or anticipated climatic stressors that may be harmful or advantageous. [1]. Indicator of corn farmers in the study area have adapted to climate change is shown in Figure 3.

Table 3. Climate change adaptation by farmers

No	Indicator	Score	Category
1	Using high-yielding varieties	54	High
2	Changing tillage	43	Medium
3	Adjusting the planting time	53	High
4	Changing cropping pattern	27	Low
5	Changing watering technique	23	Low
6	Using organic fertilizer	38	Medium
7	Using plant-based pesticides	25	Low
8	Changes in pest control techniques	22	Low

Source : Primary Data (2022)
Score Range Description: 12-28 (Low category), 29-44 (Medium category), 45-60 (High category)

Two indicators are classified as high: the use of superior varieties and the adjustment of planting time. Farmers have continuously adopted these two indicators. Farmers have continuously adopted these two indicators. Special varieties have been proven to have drought resistance, disease resistance, and high productivity [22]. The planting time indicator is classified as high because farmers plant corn based on the rainy season's arrival and not on past planting time habits. Farmers have understood that planting time can change at any time, so farmers must adjust when to plant so that the plants get enough rain.

Indicators categorized as moderate are soil cultivation and the use of organic fertilizers. Tillage is divided into two phases, namely the first planting season (*rendeng/rainy*) and the second planting season (*ketigo/dry*). The soil is well-tilled in the first growing season using a tractor or plow. After plowing, the ground is loosened and given manure so that the earth is fertile and encourages high productivity. Optimal tillage in the first season is due to extended post-fall time availability. Farmers typically don't cultivate the soil in the second planting season, in contrast to the first. Farmers promptly plant corn again without tilling the soil after clearing the land from corn plants, this is done so that the corn plants get sufficient irrigation (rain). Usually, tillage takes about a week, and farmers feel that this time is too long and potentially, the corn crop will not get enough rain. Organic fertilizers are used in the moderate category because farmers understand the benefits of organic fertilizers that fertilize the soil, encourage the ground to be wet longer, and promote higher crop production [23].

Indicators classified as low are: 1) changing cropping patterns, 2) changing irrigation techniques, 3) using plant-based pesticides, and 4) changing pest control techniques. The four categories did not change before and after climate change. The cropping pattern used is still polyculture-intensive, which requires high rainfall intensity and the potential for pest attacks. From the aspect of irrigation, farmers still rely on rain as the primary source of irrigation for corn plants. There is no irrigation either through the construction of water reservoirs and wells for irrigation. Finally, OPT control still uses chemical pesticides and herbicides. The farmers believe that chemical pesticides and herbicides are easier to use,

more affordable, and more effective at eradicating weeds and pests that interfere with maize production [24]

4. Conclusion

Farmers have limited knowledge of climate change between 40% and 70%. Only 40% of farmers know about predicting climate change, and 46.67% are aware of accessible sources related to climate change. Farmers' knowledge of other aspects of climate change (Climate change forms, adaptation to climate change, and climate change effects) was 53.33%, 63.33%, and 66.67%, respectively. Overall, farmers' knowledge level in the research location on climate change is still low. Of the eight adaptation indicators, two are classified as high: the use of improved varieties and adjustment of planting time. Two other indicators are in the medium category, and the other four are categorized as low.

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