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Farmers' Capacity in Climate Change Adaptation through Climate Field School in Banyurip Village, Pekalongan City

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Abstract

Failure to harvest that caused by weather/climate factors is a serious problem for farmers. There problems cause low productivity of farmers. Climate field school became a solution to increase the farmer's capacity in managing agricultural area. The purpose of this study is to examine the capacity of farmers from climate change. Analyzing the adaptation of farmers to climate change. This research was conducted quantitatively with quantitative descriptive methods. The population of this study was all 25 farmer participants of CFS. The techniques of collecting data were through questionnaires and interviews. Data analysis techniques using questionnaire data analysis and descriptive analysis. The results in this study showed that the farmers' capacity in the Banyurip Village had a very high capacity with an average percentage which is reaching 76.4%. Farmer adaptation strategies to climate change are increasing, which is marked by a change from conventional way to more effective and efficient treatments. Farmer adaptation behavior is characterized by increased attitudes in the management of irrigation systems, determination of tolerant rice varieties, analysis of soil content and study of cropping patterns.

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INTRODUCTION

Food security is a major issue due to rapid population growth. Conversely, the ability of farmers to produce high-quality rice varieties require a very long time so that the construction of agricultural facilities and infrastructure is needed (Adyana, 2013). Agricultural area has a big important role in increasing food security and achieving sustainable economic development (Singgih, 2015).

The environment on irrigated rice fields is more optimal than rain-fed rice fields, especially the availability of water in the dry season thereby minimizing crop failure (Adyana, 2013). The low percentage of rain that can be stored in the rainy season will cause a dry season when there is a water deficit marked by drought (Irianto, 2000).

Individuals naturally have a capacity that is inherent in them. The ability of farmers to meet their needs in accordance with their potential is the capacity of farmers that should not be ignored (Herman, et al. 2008). According to Suprayitno (2018) Farmers' capacity is used as a way to optimize the function of land which is the key to improving agricultural quality. Farmers' capacities can also be assessed including: technical ability, problem solving, farm planning, evaluating farming, environmental adaptation and partnering. Thus, the indicator is also a differentiator and a measure of the level of farmers' capacity in managing farming (Herawati, 2017).

According to Sumaryanto (2013) adjustments in dealing with climate change are seen as a dynamic process because the situation and environmental conditions faced are also dynamic. In general, heavier environmental requires a higher level of adaptation.

The impact of climate change which is detrimental to farmers is drought. In line with Reynaldi (2017) drought is a natural disaster caused by lack of rainfall and knowing the characteristics of drought, which is the reduction of water in rivers.

Ichdayati (2014) explained that climate change adaptation is an act of farmers' adapting with the aim of reducing the negative impacts caused by climate change. Adaptive capacity in social systems also produces a survival strategy model in historical - ecological sociology (Sunarjan, 2018).

Based on Parmesan and Yohe (2003) the ecological system has changed due to climate change. These changes are seen in the spring which occurs 2 or 3 days earlier per decade. The main factor triggering increased carbon emissions is deforestation.

Climate change greatly affects the agricultural sector, especially in the cropping pattern, planting period, production and yield quality (Chodijah, 2018). The decline in agricultural production is due to a decrease in harvested area. The results of that study, the La Nina incident negatively affected rice production in Java (Hidayati, 2015).

Some relevant researches become references and consideration in the composing of this first article by Massinai (2013) which states that agro-industry based on farming in tidal land can be applied in other areas. The application of specific agricultural technology affects an increase in rice field production. However, the factor of farmers as actor remains the key to the successful application of these technologies.

Research by Turasih (2016) has found that the broader land is controlled by farmers, the value of access to capital is relatively higher and the level is getting lower. Whereas the results of Rusiyah's (2012) study state that the internal socio-economic characteristics of farmers for the development of organic rice field farming.

Utami, et al. (2011) conducted a study of El Nino, La Nina and food supply in Java. The results of his research showed that the El Nino climate anomaly had a negative effect on rice production in Java.

Solihin, et al. (2013) conducted a study aimed at finding out the factors that influence the productivity of rice. The study found that the decline in agricultural output due to climate change increases the probability of farmers to change their jobs.

Ayanwuyi, et al. (2010) produced findings in Nigeria. The results of that study are that farmers are aware of climate change and its impact on food crop production, and farmers have been able to develop livelihood strategies and adaptations undertaken to overcome the effects of climate change on food crops.

Climate Field School (CFS) is a program/activity to improve farmers' knowledge and ability to understand climate elements. The activity compiled the planting system (time and cropping pattern) based on the results of climate change analysis. The implementation of CFS prioritizes regions affected by climate change (floods and drought) (Hidayati, 2015). One of the regions that implement CFS and is affected by climate change is Banyurip Village, Pekalongan City.

Banyurip Village, Pekalongan City is an area that has the potential to cultivate lowland rice field. Banyurip Village is an CFS implementation area that is interesting to be research because of to seeing farmers' behavior to CFS program. This research's aim because researchers want to know the changes and the relation of farmers' behavior after doing CFS program.

CFS is assumed to be able to restore the socio-cultural role of the farming community to the diversity of thought and innovation in the utilization of internal and external resources (Luran, 2016). According to Herrick and Sarewitz (2000) traditional approaches in climate change analysis are needed because they relate to the ability to predict natural conditions periodically.

The results of the study are in accordance with CFS activities that prioritize the skills of farmers participating in groups in reading agro-climate areas. Participation is more an ideas, opinion or constructive thought, both to compile the program and to facilitate the implementation of the program and to make it happen by providing experience and knowledge to develop the activities that follow (Sunarjan, 2014:9).

Farmers as the main actors in deciding land treatment that should be given assistance or counseling. Climate field school as non-formal education is very appropriate as a forum to increase the capacity of farmers (Azizah, 2015). Based on the background above, this paper goal is to examine the capacity of farmers in climate change adaptation through the Climate field school in banyurip Village, Pekalongan City.

RESEARCH METHODS

This research took place in Banyurip Village, Pekalongan City. The reason to make this school as a research location is, because in this village there is a Sekolah Lapang Iklim program and has implemented the program to the end. In addition, this village has several agricultural problems such as drought and pest development. The problem is due to its location in the lowlands and at an altitude of ±6 masl (BPS, 2018).

This research uses quantitative research methods with quantitative descriptive methods. The populations in this study were 25 participants from Climate field school. Due to the increasing number of its population, the entire population is a sample and this research uses population research (Sugiyono, 2012). The data collection techniques used in this research was questionnaires and interviews. Questionnaires and interviews were conducted by researchers with all 28 CFS participants. Data analysis techniques were using quantitative descriptive analysis techniques.

RESULTS AND DISCUSSION

Overview of Research Locations

This research is located in Banyurip Village, South Pekalongan District. The determination of the location of this research is because in Banyurip Village there is Climate field school program. Banyurip Village is a village in South Pekalongan District, Pekalongan City. It is bordered by Buaran Village in the north, Kertijayan Village in the south, Kradenan Village in the east and Curug Village in the west.

Banyurip Village is located at the coordinates of 6°54'06" Southern Latitude -

6°56'04" and between 109°39'20" East Longitude - 109°42'17" East Longitude. The distance between the Capital District and Banyurip Village ± 4kms. The total area of banyurip Village is 1,64kms² (BPS, 2018).

The topography of this region is lowland with ±2.50 masl consisting of ricefield and dry land areas. Has a fairly high rainfall of 2.100 mms/year. Then based on climate classification according to Oldeman, it includes type C category because it has 5 Wet Months, 5 Humid Months, and 2 Dry Months (BPS, 2018).

Farmers' Capacity in Processing Agricultural Areas

Farmer capacity is the ability possessed by farmers in managing their agricultural area. Factors that affect the capacity of farmers based on the characteristics of farmers (age of farmers) and how long the experience of farming. The study analyzes the ability of farmers before and after Climate field school program. From the results of interviews with farmers, especially CFS participants and agricultural workers, it can be seen that the capacity of farmers influences land yields.

Table 1. Farmers' Capacity Based on the Indicators

No	Farmer Capacity	Indicator
1	Farmer Technical Capabilities	Agro-climate analysis before planting Determination of cropping patterns Determination of agricultural equipment
2	Ability to read environmental changes	Selection of rice varieties Irrigation systems Adjustment of planting schedules
3	Ability to Overcome Problems	Scarcity of production facilities Making fertilizer with simple ingredients Control of pests/diseases repair of irrigation canal

Source: The Results of Research, 2019

Based on Table 1. Farmer's capacity can be known based on the indicator. The technical ability of farmers is related to how farmers are able to determine planting period according to local climatic conditions. The ability to read environmental changes is related to farmer's adjustment in determining the cropping pattern that corresponds to the local climate. The ability to overcome problems related to behavior of farmers who are able to find solutions wisely related to problems on agricultural area.

Researchers use questionnaires to determine the farmer's capacity level. In this study, a questionnaire was used to see how high the capacity of farmers in climate change adaptation is. For the percentage of capacity on each respondents have the results presented in table 2.

Table 2. Percentage of capacity related to Farmer's capacity by Category

Respondents	Percentage (%)	Category
1	90	Very High
2	95	Very High
3	75	High
4	45	Moderate
5	85	Very High
6	75	High
7	45	Moderate
8	75	High
9	70	High
10	80	Very High
11	75	High
12	80	Very High
13	25	Low
14	85	Very High
15	95	Very High
16	75	High
17	75	High
18	80	Very High
19	75	High
20	95	Very High
21	90	Very High
22	85	Very High
23	70	High
24	90	Very High
25	80	Very High
Total	1910	
Average	76.4	Very High

Source: The Results of Research, 2019

From the results of the questionnaire obtained an average value of all farmers that is 76.4% with a very good category. Table 2. Show that there were 13 farmers who received very high categories. The farmer who gets a low category is 1 person. This shows that the response results are very high or the capacity of farmers in climate change adaptation is very high. To see the results of the average percentage of responses on each indicator can be seen in figure 1.

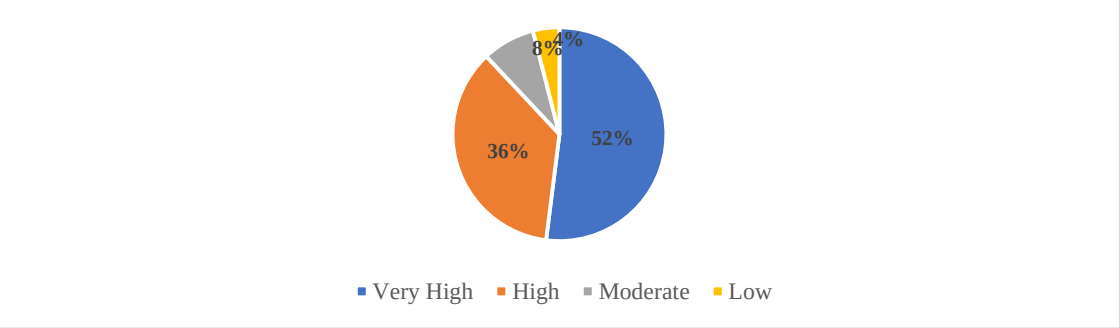

Figure 1. Percentage of Farmer's Capacity Categories
Source: The Results of Research, 2019

From this figure, it obtained the average results of each statement on the response questionnaire. From the results of the response to the capacity of farmers in climate change adaptation it can be seen that the response is very high at 56%, high response reaches 36%, the moderate category reaches 8%, and low response only reaches 4%.

This proves that every meetings of Climate field school, provides knowledge so that farmers' capacity is developing. So based on the response of the Capacity Building Strategy of Farmers through Climate field school it can be concluded that the capacity of farmers in climate change adaptation is very high.

Farmers Adaptation Strategies in Facing Climate Change

The adaptation strategy is carried out as an effort to adjust to climate conditions caused by the phenomenon of climate change due to global warming. Strategies and general policies in tackling the impact of climate change on agriculture can be viewed from the food crops and horticulture subsector as a main priority. In general, the impact of climate change in the Banyurip Village on agriculture can be described in figure 2:

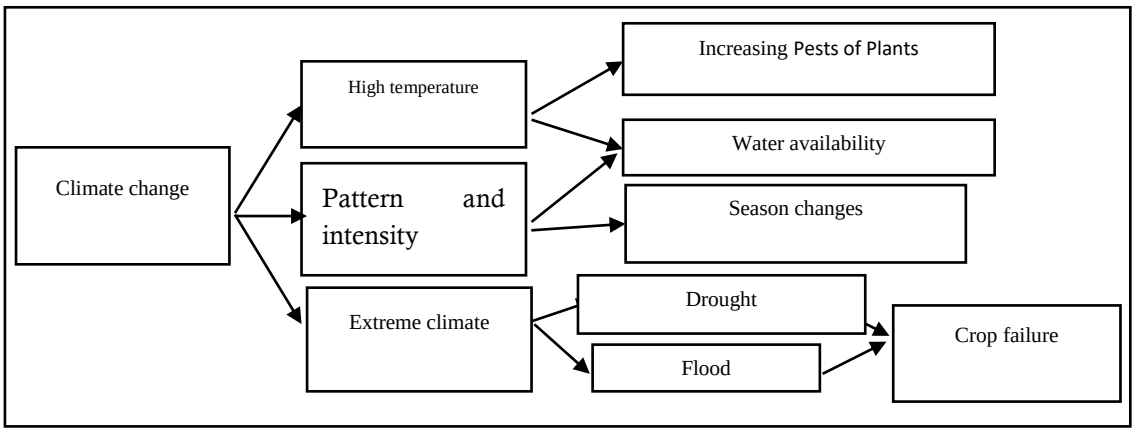

Figure 2. Scheme of the Impacts of Climate Change on Agriculture
Source: The Results of Research, 2019

Based on Table 2. The risk of yield losses incurred must be overcome by increasing the capacity of farmers. This is done because agriculture is one of the main livelihoods. Based on research results obtained from interviews with respondents, adaptation problems that need to be improved include irrigation system management, study of cropping patterns and determination of tolerant rice varieties.

Table 3. Climate Change Adaptation Strategies on Farmer's Behavior

Adaptation to Climate Change	Farmer's Behavior
Irrigation Management System	Farmers manage irrigation systems appropriately to maintain water availability.
Conducting Planting Pattern Study	Farmers required to be wise in their analysis and determine the planting period and adjusted to the average rainfall rate data.
Determination of Varieties in Accordance with Tolerant Types	Farmers determine rice varieties before planting time. The varieties planted must be in accordance with drought tolerant types, immersion, salinity and the presence of pests and diseases.

Source: The Results of Research, 2019

Table 3. Stating that the management of irrigation systems the majority of farmers, especially CFS in Banyurip Village still use macak-macak irrigation. This system was chosen because farmers think it is more precise to use by giving water aimed at wetting the land to be saturated, without being flooded until reaching a certain height. The efficiency of use on irrigated land by macak-macak is almost 2-3 times higher than that of continuously flooded land.

Time adjustment and cropping patterns are very strategic efforts in the adaptation approach to reduce or avoid the effects of climate change due to seasonal shifts and rainfall patterns changes. Based on the results of research by farmers participating in the CFS participants determine the planting patterns with the help of kalender tanam (KATAM) provided by the instructor. The concept of cropping patterns used by farmers in Banyurip Village is the padi-padi-palawija cropping pattern.

Determination of toleran rice varieties is determined before planting. Kinds of tolerant that must be adapted to rice varieties are immersion, drought, salinity and the presence of pests/diseases. This is done with the goal of varieties that accordingly planted so that the results obtained are more effective.

The results of this study are in line with the results of Ika Pratiwi's research which found that farmers' adaptation strategies in cultivating land must use appropriate technology. The application of technology and the use of agricultural tools are adjusted to environmental conditions so that the results are more effective and efficient.

Table 4. types of Rice Tolerant based on Varieties and Superiority

Tolerant Types	Rice Varietas	Superiority
Drought	Inpari 18, 19, 20 Inpago 4, 5, 6, 8	Results effective ±8.0 tons/hectare
Soaking	Inpari 29, 30 Ciherang Sub 1 Inpara 4, 5 Bestari	Results effective ±7.6 tons/hectare, for bestari with a yield ±11 tons/hectare
Salinity	Inpari 34, 35	High results effective up to ±9.5 tons/hectare
Pests/ Diseases	Inpari 13, 18, 19, and 20, 15 paranghiyangan, 28 kerinci Inpara 9 ELO Padi gogo	Resistant to brown plant hopper, stem leaf blight, tungro disease, racial blast disease and pathotype III leaf blight.

Source: Agricultural Research and Development, 2019

Table 4. explains that rice planting that is effective and efficient according to climate change should pay attention to varieties of rice. Farmers are required to have the capacity and knowledge related to varieties that are tolerant, expected to be developed through Climate field school.

The results of the meeting agreed by the farmers used BESTARI or Benih Super Batan-RI variety. The BESTARI variety is included in the superior varieats with the benefits of having a character that is tolerant of drought and puddle. So even if the research location is in flood conditions or drought will not be a problem.

CONCLUSIONS

The capacity of farmers related to climate change based on research results shows that the management has been able to read the local climate conditions before planting. Farmers can determine attitudes related to local climate change. In addition, farmers are able to determine agricultural machinery that is in accordance with the topography of agricultural land. Based on its adaptability, farmers have been able to analyze the right rice varieties according to the local climate.

Farmer adaptation strategies related to climate change are mostly obtained from Climate field school program. The strategies adopted include changing the way of farming from conventional systems to the use of more effective and efficient agricultural technology by managing irrigation systems, determining tolerant rice varieties, analyzing soil content and studying cropping patterns.

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