Correlation Between Knowledge of The Farmers - The Alumni of Climate Field School at Kabupaten Bogor and Adaption to Climate Change

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Abstract. This study aims to find out the relationship between knowledge of the farmers, the alumni of Climate Field School at Kabupaten Bogor and adaptation to climate change. A quantitative research method with a survey approach was used in this study. The study is population research in which the overall respondents were taken from the population. The respondents are the farmers who are the alumni of Climate Field School (CFS) that totaled 25 persons, living in 4 Kecamatan (districts): Kecamatan Leuwiliang as many as 10 persons, Kecamatan Leuwisadeng as many as 6 persons, Kecamatan Rumpin as many as 4 persons, and Kecamatan Nanggung totaled five persons. Data collection technique used is a closed questionnaire comprising 25 questions for X variable and 15 questions for Y variable. Based on the result of the study, it shows that the data with medium category was obtained from the medium knowledge. In addition, based on the result of correlation test, it took \( r_{count} \) was as many as 0.486 and \( r_{table} \) was as many as 0.396, which presented that there is a strong relationship between the knowledge of the farmers who are the alumni of Climate Field School and the adaptation to climate change. So, the result of the study shows that after following Climate Field School the farmers master the knowledge and practice the adaptation to climate change in farming activity.

1. Introduction

Global climate change as an implication of global warming has been the result of the instability of atmosphere at the bottom layer especially those which are close to the earth surface. This global warming is as the effect of the rise of greenhouse gases which are caused dominantly by industries. The observation on global temperature since the 19th century indicates that the average change of temperature becomes the indicator of climate change. This global temperature change is risen by an average of 0.74°C from 1906 to 2005 [11].

The temperature change of atmosphere makes the physical condition of the atmosphere more and more unstable and causes the anomalies toward the climate parameter that lasts long. In long term, these anomalies will make the climate change. The impacts of climate change are varied and almost influence the overall sectors of development, including health, agriculture, food, forestry, and coastal areas. This climate change also makes any regions more vulnerable than ever.

Agriculture is one of the sectors which is most vulnerable influenced by climate change. This phenomenon causes the decrease of agriculture productivity that in the end will threaten food security.
for a human. Drought and flood are the examples of a threat to the farmers in Indonesia that they will frequently meet. The destruction of environment and agricultural practices that are not environmentally friendly influence the ecological balance. The boom of salinity pests that are more and more are the impacts of the threat above. The farmer’s ability to adapt in encountering the impacts of climate change is becoming increasingly important to reduce the losses because of it. The adaptation of climate change can be defined as a response of adjustment which is done to overcome the impact of climate change.

The losses are hard to predict because the farmers and the local government did not understand the importance of information on climate in which the farmers have averagely minimum education so that they cannot easily understand the information. In addition, the information on the climate is still general and is not available quickly so that the farmers cannot think of any problems on the climate. Both the farmers and the local governments have not taken care of the importance of the information on climate yet. So far, the local government has not thought of the importance of climate, moreover the farmers themselves.

The farmers’ knowledge of climate change and the climate characteristic happened in their regions is absolutely needed. By the knowledge of the climate, the farmers are expected to utilize it as maximum as possible for the food cultivation they do. It is known that the climate in one region affects its agriculture very much. If the farmers do not know or cannot use a certain strategy on the climate problem, it can be a boomerang when the farmers conduct their business.

One of the methods to improve the farmers’ knowledge and ability in understanding the elements of climate is Climate Field School (CFS), a modification of CFS activities which focuses on learning by doing, learning through a direct field practice in managing agroecosystem from climate aspect. Climate Field School (CFS) is a field school conducted in the open nature by empowering the farmers to make them able to recognize the climate condition and local wisdom in doing agriculture cultivation, specifying on location. This can minimalize the decrease of agriculture products as a result of the impact of climate phenomenon (flood and drought) [4].

Climate Field School—which is established by BMKG Darmaga, Bogor, West Java— is located in Kabupaten Bogor and as an anticipation of the extreme climate change toward the national food security in the region. The participants of this school consist of 4 kecamatan (districts), that are Kecamatan Leuwiliang, Kecamatan Leuwisadeng, Kecamatan Rumpin, and Kecamatan Nanggung. The information on climate is beneficial to predict the season according to the natural phenomenon residing within the farmers'own environment. By this information, the farmers can determine varieties and planting time in accordance with the specification of each region and control the pests and the diseases using biological agents. The implementation of the CFS program is expected to improve the farmers’ comprehension and knowledge on the climate concerning with the adaptation toward the variability of the climate and to anticipate the extreme climate.

Based on the background above, this paper aims to study “The Correlation Between knowledge of The Farmers, The Alumni of Climate Field School at Kabupaten Bogor and The Adaptation to Climate Change”.

2. Methods
This study was conducted at Kabupaten Bogor by taking 4 (four) Kecamatan as a place of study where the respondents live. The four kecamatan are Kecamatan Leuwiliang, Kecamatan Leuwisadeng, Kecamatan Rumpin, and Kecamatan Nanggung. The length of the study was from March 2017 to January 2018. The study was designed as qualitative research by using a survey approach. The questionnaire was used to collect data about the farmers’ knowledge and adaptation. The research design was illustrated as Figure 1.
Population in this study was all the farmers, the alumni of Climate Field School at Kabupaten Bogor as many as 25 persons. The study was a population study where taking the overall respondents from the population. The respondents are the farmers, the alumni of Climate Field School (CFS) which totals 25 persons who live in four (4) Kecamatan consisting of 21 males and 5 females.

After the data was collected, the data were analyzed to examine the hypothesis quantitatively. The technique which was used in analyzing data used is a simple correlation coefficient test. The steps were in the following:

2.1. Data Normality Test
A normal test was conducted to find out the distribution of research data whether normal or not. In this study, the normality test was conducted to know the value of data normality based on the statistics of the Kolmorov-Smirnov Wilk test by using SPSS 16.0 version to count.

\[
\begin{align*}
If \ the \ value \ Sig > \alpha \ (0.05), \ the \ data \ distribution \ is \ normal & \quad (1) \\
If \ the \ value \ Sig < \alpha \ (0.05), \ the \ data \ distribution \ is \ not \ normal & \quad (2)
\end{align*}
\]

2.2. Linearity Test
A linear relationship test was conducted to prove whether a free variable has a linear relationship to a bound variable. The linearity test was conducted to examine the level of meaning of the equation of linearity from the linear relationship. Two variables are said to have a linear relationship if the significance (linearity) is less than 0.05 [16]. By using an SPPS Software 16.0 version, the provisions are:

\[
\begin{align*}
If \ the \ value \ Sig > \alpha \ (0.05), \ the \ data \ distribution \ is \ linear & \quad (3) \\
If \ the \ value \ Sig < \alpha \ (0.05), \ the \ data \ distribution \ is \ nonlinear & \quad (4)
\end{align*}
\]

2.3. Correlation Coefficient Test
The analysis of hypothesis testing aims to know whether the research hypothesis that is made can be accepted or not. This analysis does not examine the truth of the hypothesis, but the rejection or the acceptance of the hypothesis. By using an SPPS Software 16.0 version, the provisions are:

\[
\begin{align*}
&\ r_{count} > r_{table}, \ thus \ H_1 \ is \ accepted & \quad (5) \\
&\ r_{count} > r_{table}, \ thus \ H_1 \ is \ rejected & \quad (6)
\end{align*}
\]

Data was taken from the instrument in the form of a questionnaire comprising of questions that should be answered by the respondents. The test used is a multiple choice test which totals 30 items with four alternative options a, b, c, and d. If the respondents choose the right answer, the score is 1; meanwhile, if the answer is wrong, the score is 0. The final score of the respondents is the total of the correct answers. The data about the adaptation of climate change was obtained by the closed questionnaire which totaled 13 items using a Likert scale with the optional answers: Always by the score 4, Often by the score 3, Seldom by the score 2 and Never by the score 1. If the statements are negative, the scores are the opposite.
### Table 1. Instrument Outline of Variable X

| Research Variable X | Indicator | Number of items | Total of item |
|---------------------|-----------|-----------------|---------------|
| Knowledge of the farmers from Climate Field School | Analysis of Agroecosystem | 1,2,3,21 | 4 |
| | Recognizing weather and climate | 4,5,6,19 | 4 |
| | The process of cloud and rain formation | 7,8,9,23 | 4 |
| | (Ground) Water Balance | 10,11,12,20,24 | |
| | Information and prediction of the climate | 13,22,25 | 3 |
| | Weather/climate effects cuaca/iklim terhadap OPT | 14,15,16,17,18 | 5 |

### Table 2. Outline of Research Instrument of Variable Y

| Research Variable Y | Indicator | Number of items | Total of items |
|---------------------|-----------|-----------------|---------------|
| Adaptation of Climate Change | Adjustment of time and planting pattern | 1,2,3,4,5 | 5 |
| | The use of superior varieties | 6,7,8 | 3 |
| | Change of land processing | 9,10,11 | 3 |
| | Developing water processing technology water management | 12,13,14,15 | 4 |

### 3. Result and Discussion

3.1. **Knowledge of the Farmers, the Alumni of Climate Field School**

Knowledge the farmers got after following Climate Field School consists of 6 indicators, that are agroecosystem analysis, recognizing weather and climate, the process of cloud and rain formation, (ground) water balance, information and prediction of climate, weather/climate effects toward Plant Disturbing Organism (PDO). The farmers are expected to obtain high knowledge so that they can highly adapt to climate change. After the overall data of each indicator had been analyzed, the final result of the data of knowledge was got. The following is the table of the knowledge score of the farmers, the alumni of Climate Field School:
Table 3 Knowledge of the Farmers, the Alumni of Climate Field School

| A score of the Respondents’ answers | Category | Frequency | Percentage |
|-------------------------------------|----------|-----------|------------|
| >16                                 | High     | 3         | 12         |
| 10-16                               | Medium   | 16        | 64         |
| <10                                 | Low      | 6         | 24         |
| **Total**                           |          | **25**    | **100**    |

Source: Result Study, 2017

Based on Table 3, it shows that the knowledge of the farmers, the alumni of Climate Field School have a high category knowledge by the percentage 12% or 3 respondents, a medium category by the percentage 64% or 16 respondents and a low category by the percentage 24% or 6 respondents. Thus, the knowledge of the farmers, the alumni of Climate Field School is included in a medium category. It can be interpreted that after following the training the most of the farmers, the alumni of Climate Field School keep mastering the material from Climate Field School. They still have good knowledge after following the program. Knowledge with the high category of all indicators is about water balance with the high category score of 64% or 16 respondents. The material of water balance aims to train the farmers to understand the water balance and its elements. Meanwhile, knowledge with the low category of all indicators is about information and prediction of the climate with the low category score of 24% or 6 (six) respondents. After following the school (CFS), the respondents still don’t understand it. One of the objectives in establishing Climate Field School is to improve the comprehension of the climate information such as the prediction of the rainy and dry season.

3.2. Adaptation of the Farmers-the Alumni of Climate Field School to the Climate Change

Adaptation of the Farmers (the Alumni of Climate Field School) to the Climate Change consists of 4 (four) indicators: the adjustment of planting time and pattern, the use of superior varieties, the change of land processing and the development of water processing technology. Good adaptation in climate change is expected to help the increase of productivity and prevent the losses in agriculture. The following table is the table of adaptation score of the farmers (the alumni climate field school) on the climate change:

Table 4 Adaptation of the Farmers (the Alumni of Climate School) to the Climate Change

| A score of the Respondents’ answers | Category | Frequency | Percentage |
|-------------------------------------|----------|-----------|------------|
| >37                                 | High     | 4         | 16         |
| 26-37                               | Medium   | 16        | 64         |
| <26                                 | Low      | 5         | 20         |
| **Total**                           |          | **25**    | **100**    |

Source: Result Study (2017)

Based on Table 4, it shows that the adaption of the farmer (the alumni of Climate Field School) which included high category as many as 4 respondents (16%), medium category 16 respondents (64%) and low category 5 respondents (20%). Thus, the adaptation of climate change for the alumni of the field school is in the medium category.

Adaptation to climate change with the high category of all indicators is the use of superior varieties with the high category score of 32% or 8 respondents. Adaptation to climate change affects the varieties of rice plant that is cultivated, the variety the farmers commonly used is *ciperang* variety. At present, they do not use it because the variety is susceptible. Therefore, the farmers should select the varieties that are resistant to diseases and pests. They are required to buy seed in local breeders. If not,
they should use the specific seeds from their respective areas that are suitable for the weather. The use of superior varieties can suppress PDO attacks and contribute to the increase of the rice production.

Adaptation to climate change with the low category of all indicators is the development of water processing technology with the low category score of 12% or 3 respondents. Water processing technology employs semi-technical irrigation, not rainfed one. In addition, the technology manages the tertiary irrigation. The tertiary channels must be able to flow the water sufficiently to the tertiary plots to make the paddy fields capable to inundate. The use of water irrigation by the farmers can be saved by declining the height of water inundation.

3.3. Correlation Between Knowledge of the Farmers (the Alumni of Climate Field School at Kabupaten Bogor) and Adaption to Climate Change

The correlation between the knowledge of the farmers (the alumni of climate field school at Kabupaten Bogor) and adaptation to the climate change is found out by analyzing the two variables. The correlation test between knowledge and adaptation variables was conducted by a simple correlation analysis using Spearman Rank method. Based on the data analysis using the Spearman’s correlation calculation with SPSS program 16.0 version, the result presents that the probability value 0.014 less than $\alpha = 0.05$; it can be concluded that $H_0$ is rejected, it means that there is a correlation between the knowledge of the farmers (the alumni of climate field school at Kabupaten Bogor) and adaptation to the climate change. Based on the correlation test, it shows that $r_{\text{count}}$ as many as 0.486 and $r_{\text{label}}$ as many as 0.396 indicating that there is a strong relationship between the knowledge of the farmers (the alumni of climate field school at Kabupaten Bogor) and adaptation to the climate change. Based on the research result, it shows that the medium category adaptation data is obtained from the medium knowledge. The level of knowledge with the medium category is caused by the attendance rate that is not maximum. Adaptation to the development of (ground) water processing technology is still low. Therefore, it is suggested to use intermittent irrigation technique, rotating irrigation or macak-macak irrigation to increase the efficiency of water usage and to decrease a methane emission.

4. Conclusions

Based on the research result, it shows that there is a significant relationship between knowledge of weather and climate and adaptation to climate change. In other words, it is concluded that the knowledge the farmers got by following the training of Climate Field School relates to their attitude in adapting to the climate change associated with farming practices. Adaptation to the development of (ground) water processing technology is still low. Therefore, it is suggested to use intermittent irrigation technique, rotating irrigation or various irrigation to increase the efficiency of water usage and to decrease a mean emission.

To make the training run optimal and to master the given materials, the participants are suggested to attend maximally and to take the more participants for the next training. The participants who follow Climate Field school are expected to be more optimal in learning the materials and practicing them. Furthermore, it needs monitoring and a counseling or mentoring post-training, that is when the farmers do their daily activity.

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