Climate Change and Agriculture: An Economic Valuation of Flood Risk Mitigation

Endah Saptutyningsih[1,*], *Rulia* Akhtar[2], *Diah* Setyawati Dewanti[1], *Tri* Anggoro[3]

[1] Department of Economics, Faculty Economics and Business, Universitas Muhammadiyah Yogyakarta, Indonesia
[2] Ungku Aziz Centre for Development Studies, Universiti Malaya, Malaysia
[3] Magister Ekonomi, Post Graduate Program, Universitas Muhammadiyah Yogyakarta, Indonesia

Abstract. Climate change has a negative impact especially on agriculture. Due to unpredictable seasonal changes and floods, agricultural land can be damaged. Mitigation strategies are needed to anticipate more serious impacts from the threat of climate change. According to this research, farmers in Temanggung, Indonesia, are willing to pay (WTP) for climate change mitigation programs because their land is flooded. We examined the ways in which social capital influences tobacco farmers' willingness to contribute to climate change mitigation as well as the other factors that affect climate change mitigation. To monetarily assess farmers' preferences for planned mitigation programs, we use the contingent valuation method (CVM). This method ensures the inherent value of addressing climate issues in the agricultural sector of Temanggung, Indonesia. Sample farmers received a prepared questionnaire. This study found that 78% of people surveyed were willing to pay IDR 17,000.00 (USD 1.05) for climate change mitigation programs and several factors, including assets, social capital, and flood characteristics, had a greater influence on their willingness to pay. This research will help policymakers create better mitigation frameworks to combat the adverse impacts of climate change, especially on the agricultural sector.

1 Introduction

Concerns about potential effects of climate change on food production [1] and farmer welfare [2] are widespread throughout the world. Agroeconomics can be threatened by bad weather, unexpected increases in temperature, and variations in rainfall [3]. Numerous Asian research look on how climate change affects farmers and crops. [4] showed that climate change in South Africa could cause a decline in maize production of up to 30%. Studies conducted in tropical regions, especially in Southeast Asia, show that increasing air temperatures and climate change will cause a decrease in corn and rice production, which will result in a decrease in corn and rice production. Climate change has both direct and indirect effects on farmers' ability to maintain social and economic stability. Crop failure, higher production costs, lower farmer earnings, and growing seasonal unemployment rates are examples of

* Corresponding author: endahsaptuty@umy.ac.id

cascading effects [5,6]. The lack of institutional ability, lack of local expertise, and lack of understanding of the difficulties, however, is the reason why farmers are not very concerned about climate change [7].

Climate change causes various kinds of problems, one of which is changes in rain patterns that make seasons unpredictable and increase and decrease rainfall in an area that has the potential to cause flood disasters [8]. When it rains heavily, rainfall causes flooding on some agricultural land. Floods can not only reduce the productivity of rice fields, but rice fields can also be damaged and can no longer be planted if they are permanently inundated [9]. This incident occurred in an agricultural area in Bulu District, Temanggung Regency. As a result of high rainfall, the cliffs on the mountain slopes became landslides accompanied by flash floods, which directly damaged agricultural land around the source of the disaster. The fast-flowing water caused several embankments and even irrigation channels to break, and the water overflowed into agricultural land so that all farmers' crops, such as rice, vegetables, tobacco, secondary crops, and other crops, were damaged as a result of the flood, which resulted in farmers experiencing significant losses from the disaster this flood that hit.

Adaptation techniques are necessary due to the rising danger that climate change poses to agriculture. Adaptation strategies must be developed in order to counter the mounting threat that climate change poses to farmers. As a result of climate change, the most vulnerable individuals already find it difficult to lead safe and fulfilling lives [10]. Uncertainty related to climate change can be recognized, managed, and used as input into agricultural decision-making. Able to understand, monitor, and anticipate climate change. As a result, farmers can consider different management approaches and contextualize past experiences to make informed decisions. This can assist people in minimizing losses during difficult times and maximizing revenues during prosperous ones. By leveraging climate information, farmers can use technology and input more effectively and with less uncertainty. A deeper knowledge of the climate can help agriculture become more robust to shocks. This can lessen climate-related risks and boost climate resilience.

Climate change has an influence on the social and economic sustainability of the agriculture industry, both directly and indirectly. Climate change causes high production costs, inadequate harvests, and low productivity. As a result, they experience a decrease in income and an increase in unemployment rates during the summer [5]. Most people may already know about the phenomenon of climate change, but only a few people are aware of its impact and urgency. Ultimately, a lack of awareness leads to little or no change. Lack of knowledge and access to effective platforms where they can be heard or do something.

Increasing social capital's roles in communities is one way to mitigate the effects of climate change, as it has an impact on economic performance [11-15]. As per specific studies, social capital pertains to the norms and confidence that enable individuals within a society to act cohesively [16,17]. "Cognitive social capital" was developed by [18]. Social capital and natural resource management have been linked in several research. Think about whether social capital has a good or negative impact on group behavior [19]. People may work together to manage natural resources by utilizing their social capital, according to [20].

Farmers' livelihoods may be improved by using new agricultural innovations and technologies or by changing farming practices [21-23]. Friends and family are examples of social networks that may influence farmers' attitudes towards climate change adaptation [24], expand their understanding of adaptability [25], improve their ability to forecast risks and losses brought on by climate change in the future and control their financial preparedness for adaptation costs [26]. The Indonesian Climate Change Sectoral Roadmap (ICCSR) recommended establishing new plantations and teaching farmers about cutting-edge technology through the use of social capital.

Previous research on flood management has included the CVM technique for flood risk. For instance, the home WTP for a flood control project in Brazil was evaluated using the

CVM technique [27]. They looked at a few factors that significantly affect the CVM outcomes, and the study revealed that this strategy is inappropriate for flood control projects in developing nations' low-income areas [27,28] Using CVM to calculate Greece's expenses for adaptation and mitigation of climate change. This research has led to the conclusion that the greatest portion of GDP utilized to mitigate flood catastrophes goes toward reducing greenhouse gas emissions.

[29] In an attempt to repair ecological harm, willingness to pay (WTP) analysis and ordinal logit regression were used to assess the factors that affect coffee growers' WTP values. The area used for farming, the productivity of the land, and the income of the farmers are the elements that might raise willingness to pay (WTP) [29] to protect agricultural land from flooding, [30] apply the same method. To fill this research gap, this research aims to determine the willingness to pay (WTP) value of farmers in Bulu District, Temanggung Regency, regarding climate change mitigation because farmers experience losses due to flooding. In addition to looking at other factors impacting climate change mitigation, we also looked at the link between social capital and tobacco growers' desire to participate in climate change mitigation.

2 Research method

2.1 Study site

The agricultural sector is greatly influenced by climate change in Bulu District, Temanggung Regency, Indonesia, where this study was carried out. Food security in this district is threatened by low agricultural production. This province's agricultural area is now more susceptible to droughts, floods, and pests due to climate change [31]. Activities and selling prices of farmers' crops decreased due to crop failure due to floods that hit agricultural land [32].

2.2 Survey design and sampling methods

To find out if farmers in the research area would be open to taking part in the process of mitigating climate change, we conducted a survey with them. Referenda on environmental taxes are used to determine if the general public supports allocating a certain sum of money to the mitigation of climate change. Finding farmers committed to mitigating climate change is the project's aim. Twenty prominent individuals participated in focus groups where the benchmark was selected. The contingent value approach was used to survey farmers in Bulu District, Temanggung Regency, to ascertain their willingness to pay for mitigating the effects of climate change [33-35]. To determine the possible financial gains for farmers that support climate change mitigation, the contingency assessment findings are consulted. In order to facilitate payments for environmental tax referendums, the contingent assessment survey was developed. In order to prepare for climate change, would you be in favor of or against the Indonesian government establishing an environmental tax of x amount? is one of the questions on our survey.

In Temanggung, an area prone to flooding, we polled 500 agricultural households. The Slovin formula establishes the minimum sample size needed for a survey. Two-stage sampling was used to conduct the poll. The method is an on-site, in-person survey [36-38]. Stratified sampling was employed in the first phase to collect representative samples from flood-affected regions. We employed a random selection of each village's agricultural household heads for the second step.

2.3 Design of the questionnaire

The final survey questionnaire was divided into five pieces. Part A maps the sociodemographic characteristics of farmers, such as age, gender, family size, income, and educational attainment. Part B of the disclosure includes the farmer's assets (land acreage and ownership); Part C of the disclosure includes social capital (community engagement, trust, and number of relatives outside the village); flood characteristics are disclosed in Part D (height of inundation and distance of agricultural land from the source of the flood); and farmers' willingness to make monthly payments for mitigating climate change is disclosed in Part E.

2.4 Specification of model

A regression model was developed to look at possible impacts on farmers' WTP for suggested climate change mitigation efforts in Temanggung, Indonesia. Respondents were given the option to select their willingness to pay (WTP) for future climate change mitigation initiatives on a yes-or-no basis. Scholars have the option to select between logistic regression and probit regression when the dependent variable falls between 0 and 1 [39]. Therefore, logistic regression was used as the assessment approach for this investigation. The elements in Table 1 are included in the model as independent variables since it is expected that they may have an impact on WTP.

Table 1. Variables included in the logit model

Variable	Variable description	Category
Dependent Variable		
WTP	WTP for climate change mitigation	1 = Willing to pay, 0 = not willing to pay
Independent Variable		
Age	Age range of farmers	Age (years)
Sex	Farmer gender	1 = male, 0 = female
Years of schooling	The last level of education attained by farmer	6 = elementary school, 9 = middle school, 12 =high school, 15 = Diploma, 16 = bachelor's degree
Income	Monthly family income	Income (IDR)
Number of family member	Number of family members	Number of family (no.)
Size of farmland	The size of the farmer's land	Land area (m^2)
Status of farmland	Farmer land ownership status	1 = Personally owned, 0 = Rented
Participation in community	Farmer participation in farmer groups	1 = Participated, 0 = did not participated
Trust in people	Lending money to others	1 = Willing, 0 = not willing
Family lives outside village	Have relatives outside the village	1 = Yes, 0 = No
Flood inundation	Floods hit agricultural land	1 = Yes, 0 =No
Distance from farmland to flood source	Distance of agricultural land to the source of the flood disaster	Distance (meters)

P (Yi = 1), the WTP probability model, is shown as Formula 1-6. The fundamental model of logit estimation is as follows:

$$Log_e = \left[\frac{\{p(y=1)|x_1 \dots x_p\}}{\{1-p(y=1|x_1 \dots x_p\}}\right] = Log_e\left[\frac{\pi}{1-\pi}\right] = \alpha + \beta_1 x_1 + \cdots + \beta_p x_{p^1} \quad (1)$$

$$\text{Log}_{e} = \alpha + \sum_{j=1}^{p} \beta_j x_j \tag{2}$$

where $P\ (Y = 1|\ X1 ... Xp)$ is a conditional probability of that type.

Another term for the analytical technique used here is logit analysis. The logit transformation of is another name for the previously stated log odd. The logistics function was as follows:

$$\langle P(Y = 1|X_1 \ldots X_p)\rangle = \frac{exp\left(\alpha+\sum_{j=1}^{p} \beta_j x_j\right)}{1+exp\left(\alpha+\sum_{j=1}^{p} \beta_j x_j\right)} \tag{3}$$

This can also be transformed into:

$$\langle P(Y = 1|X_1 \ldots X_p)\rangle = \frac{1}{1+exp\left(-\alpha-\sum_{j=1}^{p} \beta_j x_j\right)} \tag{4}$$

The non-response probability is:

$$P = (Y = 0|X_1 \ldots X_p) = 1 - p(Y = 1|X_1 \ldots X_p) = \frac{1}{1+exp\left(-\alpha-\sum_{j=1}^{p} \beta_j x_j\right)} \tag{5}$$

where respondents' willingness to pay IDR is indicated by Y = 1 (yes), while their unwillingness is indicated by Y = 0 (no). The following collection of predictors is used to create the logistic regression equation for the log chances showing support for addressing climate change:

$$\log\left[\frac{\text{p}}{1-\text{p}}\right] = \text{b}_0 + \text{b}_1\text{AGE}_\text{j} + \text{b}_2\text{GENDER}_\text{j} + \text{b}_3\text{EDUC}_\text{j} + \text{b}_4\text{INC}_\text{j} + \text{b}_5\text{NFAM}_\text{j} + \text{b}_5\text{LAND}_\text{j} + \text{b}_6\text{STATUS}_\text{j} + \text{b}_7\text{COMM}_\text{j} + \text{b}_8\text{TRUST}_\text{j} + \text{b}_9\text{FAMOUT}_\text{j} + \text{b}_{10}\text{FLOOD}_\text{j} + \text{b}_{11}\text{DISTFLOOD}_\text{j} + \varepsilon_\text{t} \tag{6}$$

The previous log equation shows a log-odd ratio and the logarithm of the chance that farmers will decide to mitigate climate change. The parameter's recommendations and statistical significance show the overall course of the farmers' response [40].

3 Results and discussion

3.1 Sociodemographic characteristics of respondents

The age distribution of farmers in the research region is displayed in Table 2. The age range of the responders was 22 to 75. Between the ages of 42 and 51, farmers made up the biggest age group (30.4%). Farmers are mostly middle-aged. Between 52 and 61, farmers make up the second largest age group (27.6%).

These results imply that middle-aged farmers make up the bulk of the farming population in the study area. However, their age distribution may help them in their efforts to mitigate climate change. Additionally, the majority of farmers (61.6%) are men, and the more men there are in the farming community, the more likely they are to take action to mitigate climate change. Farmers' educational backgrounds varied, according to this study; the majority only completed elementary school (60.6%), followed by junior high school (24%), high school (15.2%), and college (0.2%). Education distribution can have a positive impact on climate change mitigation. According to this study's findings, the largest percentage of farmers' income was determined to be, namely IDR 1,000,000 (USD 61.60) – IDR 1,500,000 (USD 92.40), was (64%), then (33.6%) had income between IDR 1,600,000 (USD 98.56) and IDR 2,100,000 (USD 129.36), and the lowest percentage was Rp. (2.4%) or income between IDR 2,200,000 (USD 135.52) and IDR 3,000,000 (USD 184.80). In this instance, income contribution to climate change mitigation can be beneficial. The number of family members varied in this study, but it had no impact on reducing climate change.

Table 2. Characteristics of respondents (N=500)

Variable	Frequency	Percentage	Variable	Frequency	Percentage
Sociodemographic			**Social Capital Characteristics**		
Age (year)			Participation in community		
22-31	28	5.6	otherwise	132	26.4
32-41	125	25	participate	368	73.6
42-51	152	30.4	Trust in people		
52-61	138	27.6	otherwise	86	17.2
62-75	57	11.4	trusty	414	82.8
Sex			Family lives outside village		
Female	192	38.4	no	56	11.2
Male	308	61.6	yes	444	88.8
Years of schooling			**Flood Characteristics**		
6	303	60.6	0	128	25.6
9	120	24.0	1	372	47.4
12	76	15.2	Distance from farmland to flood source		
15	1	0.2	0-200	378	75.6
Income (Rupiah)			210-400	106	21.2
1000000-1500000	320	64	410-700	16	3.2
1600000-2100000	168	33.6	**Asset Characteristics**		
2200000-3000000	12	2.4	Size of farmland		
Number of family member			1000-1500	159	31.8
2	78	15.6	1600-2100	162	32.4
3	90	18.0	2200-2700	53	10.6
4	236	47.2	2800-3300	82	16.4
5	81	16.2	3400-4000	18	3.6
6	15	3.0	Diatas 4100	26	5.2
			Status of farmland		
			0	20	4
			1	480	96

3.2 Characteristics of respondents' assets

Table 2 presents the distribution of respondents' asset characteristics, where the highest percentage of farmers' land size is on average between 1600 and 2100 m^2, or 32.4%). This shows that land area has a positive impact on climate change mitigation, while the land ownership status variable does not. significantly influences climate change migration.

3.3 Characteristics of respondents' social capital

Table 2 shows the distribution of respondents' social capital characteristics where as many as (73.6%) of respondents participate in farmer groups and the remainder (26.4%) do not participate, in this case the heads of households who are involved in community groups may better understand the importance of mitigation to prevent damage to agricultural land. They were caused by flooding. Therefore, participation in the community has a positive impact on climate change mitigation. Then, trusting people in this study, the percentage of respondents who trust other people and are willing to lend them money is (82.2%) and respondents who are not willing are (17.2%) where people are often more likely to support initiatives recommended by individuals they trust, especially if the initiative concerns the welfare of their family or relatives. So, it can be concluded that trusting other people has a positive impact on climate change mitigation. Meanwhile, in this research, the variable relatives outside the village did not have a positive and significant influence on climate change.

3.4 Flood characteristics

Table 2 presents that in this study, the majority of flood inundations submerged agricultural land, namely (47.4%) the number of respondents whose land was submerged by floods. In this case, the flooding of their agricultural land means that farmers have to look for solutions to deal with their damaged land. In this case, agriculture that is flooded has a positive impact on climate change in order to overcome their problems. Then the variable for the distance from the flooded land to the nearest flood source is respondents who have agricultural land at a distance of 0-200 meters from the flood source. In this case, the closer the agricultural land is to the flooded land, the greater the risk of their land being affected by flooding. So, the distance of land to the flood source has a positive impact on climate change mitigation.

3.5 Motivating factors for WTP

According to Figure 1 of this study, the majority of respondents (78%) were prepared to pay (N = 500) for projects in Temanggung, Indonesia, that mitigated climate change. The primary driving force behind their willingness to pay (WTP) was the fact that, as shown in Figure 2, 19.23% of all respondents who were willing to pay WTP indicated that they were concerned about the risks associated with climate change, 16.5% stated that it was to increase agricultural productivity, and 15.12% stated that it was to prepare for future natural disasters.

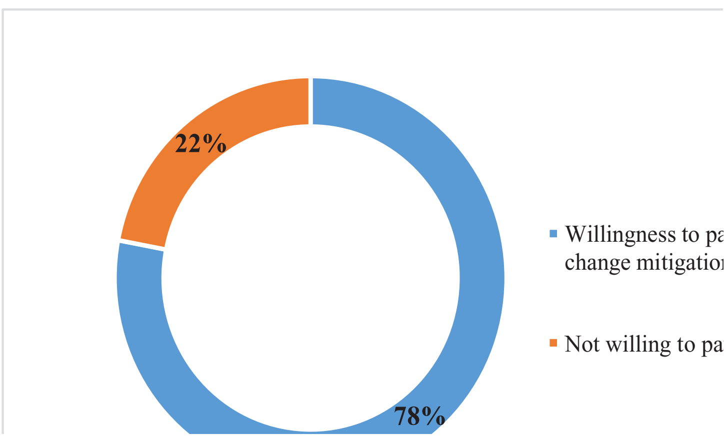

Fig. 1. Percentage of WTP

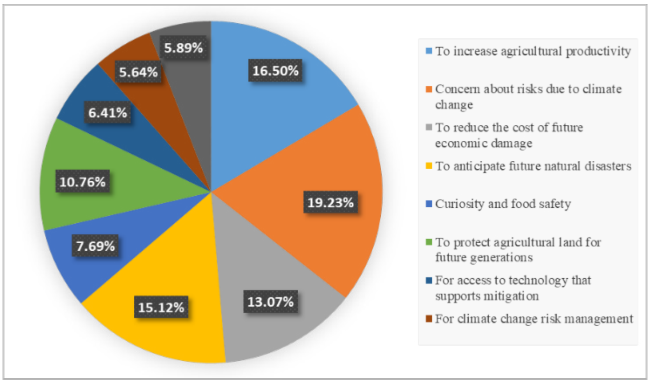

Fig. 2. WTP motivation factors

3.6 The reason farmers don't want to pay

Table 3 lists the primary justifications for not wanting to make the payment. Twenty-two percent of the respondents said they would not be prepared to pay. These respondents were questioned about their reasons for not wanting to contribute to planned climate change mitigation projects. Their denial was explained by a number of primary factors.

Table 3. Reasons for not being willing to pay

Factor	% (N=110)
My low income	29.09
I'm not sure that such a program would work	10.90
Lots of expenses for other more important needs	14.54
Programs like this are the responsibility of the government	19.09
Climate change doesn't affect me	6.36
Can handle the impacts of climate change on their own	12.72
Doesn't need such a program	7.27

First, the majority of those who were not willing to pay (29.09%) gave the reason that their income was low. Of those who refused, 19.09% said that such a program was the government's responsibility and believed that there were still many expenses that were more important than paying for this program. Only a few respondents believe that this kind of program will not work, it can be overcome on its own, climate change does not affect them, and they do not need this program, and it only provides a few benefits while others consider it unimportant.

3.7 Variables used in the model

Five phases are created for the variables in this regression model based on the respondents' sociodemographic traits. Age, gender, years of education completed, income, and the number of family members are the factors. Variables in asset characteristics consist of the size of farmland and status of farmland. Then the variables in the characteristics of social capital consist of participation in the community, trust in people, and family living outside village. And then the variables on flood characteristics consist of flood inundation and the distance from farmland to the flood source. The farmers' WTP for mitigating climate change is the dependent variable considered in this study.

Table 4 shows the positive coefficients of age (β=0.037), gender (β=0.946), education level (β=0.246), income (β=0.000), number of family members (β=-0.054), land area (β= 0.000), land ownership (β=-0.150), participation in the community (β=1.230), trust in people (β=2.136), relatives outside the village (β=-0.524), flood inundation (β=2.308), and land distance to the flood source (β=0.007). However, the coefficient only communicates its greatness. To test the significance of coefficients, tests are used. Nine variables—age, gender, education level, income, land area, community involvement, confidence in people, flood inundation, and distance of land to the flood source—are shown in the t test findings to be significant at 5% with $p<0.05$.

It may be inferred from Table 4 data and the preceding research that older farmers are more likely to support climate change mitigation. Farmers who make more money have more options to participate in climate change mitigation activities; farmers who are male are more likely to support these efforts; and farmers who have higher levels of education are more likely to wish to do so. Agricultural land area has a favorable impact on farmers' support for reducing the consequences of climate change, based on their asset features. A farmer's desire to participate increases with the size of their property. It is irrelevant what state the land is owned in.

Judging from the characteristics of social capital, social capital is very important in determining support. The community participation variable has a significant and positive impact on support. These outcomes are consistent with the belief of [41] that farmer participation in farming communities will likely make them better understand the importance of mitigation to stop the damage caused by drought. The person's trust variable has a significant influence. Farmers' trust in others will help them accept suggestions for using new technologies to anticipate and overcome the impacts of climate change. These results are in line with research conducted by [42], which states that trust is important for establishing relationships and adapting to other people. Beliefs are a description of the hopes, assumptions, or beliefs a person has about the likelihood that the actions they take now will be beneficial, good, or beneficial to themselves in the future. Meanwhile, relatives outside the village have had no significant impact on climate change mitigation.

It may be inferred from Table 4 data and the preceding research that older farmers are more likely to support climate change mitigation. Farmers who make more money have more options to participate in climate change mitigation activities; farmers who are male are more likely to support these efforts; and farmers who have higher levels of education are more likely to wish to do so. Agricultural land area has a favorable impact on farmers' support for reducing the consequences of climate change, based on their asset features. A farmer's desire to participate increases with the size of their property. It is irrelevant what state the land is owned in.

Table 4. The results of logistic regression analysis (N=500)

Variable	Estimate	Std. error	T-value	Significance
Age (AGE)	0.037	0.016	1.038**	0.020
Sex (GENDER)	-0.946	0.364	0.388***	0.009
Years of schooling (EDUC)	0.246	0.081	1.279***	0.002
Income (INC)	0.000	0.000	1.000***	0.003
Number of family members (NFAM)	-0.054	0.158	0.947	0.732
Size of farmland (LAND)	0.000	0.000	1.000***	0.014
Status of farmland (STATUS)	-0.150	0.717	0.861	0.835
Participation in community (COMM)	1.230	0.361	3.421***	0.001
Trust in people (TRUST)	2.136	0.423	8.426***	0.000
Family lives outside village (FAMOUT)	-0.524	0.540	0.592	0.332
Flood inundation (FLOOD)	2.308	0.733	10.050***	0.002
Distance from farmland to flood source (DISTFLOOD)	0.007	0.003	1.007**	0.024
Constant	-8.870	1.708	0.000	0.000

***significant at α = 1%; **significant at α = 5%; *significant at α = 10%

Dependent variable: willingness to pay for climate change mitigation

4 Conclusion and recommendation

The imperative of mitigating the escalating effects of climate change cannot be overstated. Global environmental problems are mostly caused by climate change. where the economy is very susceptible to climate change and is centered on agriculture. Therefore, the solution to this problem and the reduction of the negative consequences of climate change on agriculture depend heavily on farmers' attitudes and climate change mitigation. Agribusiness issues are brought on by extreme climate change, particularly when agricultural land is flooded. This shows that flooding is a serious problem faced by farmers. Findings show that around 78% of farmers in Temanggung, Central Java, Indonesia, are aware and willing to participate in climate change mitigation amounting to IDR 17,000.00 (USD 1.05) and 22% of farmers are not yet aware. This study found that age, gender, education level, income, land area, participation in the community, trust in people, flood inundation, and distance of land to the flood source were significant at 5% with $p<0.05$. In this instance, the majority of farmers carry out this activity and are prepared to pay for it, thus the government must put in place a planned mitigation program against climate change. Farmers will naturally be prepared to pay for some mitigation projects if mitigation techniques are performed well and they are able to understand the effectiveness of particular tactics.

Acknowledgement. The authors are grateful to Universitas Muhammadiyah Yogyakarta for funding this research with grant number 50/R-LRI/XII/2023.

References

1. W. K. Gornall J, Betts R, Burke E, Clark R, Camp J, Philos. Trans. R Soc. Lond. B Biol. Sci **365**, 2973 (2010).
2. R. R. Menapace L, Colson G, Gloval Env. **35**, 70 (2015).
3. C. Georgescu, M., Lobell, D.B., Field, Proc. Natl. Acad. Sci **108(11)**, 4307 (2011).
4. R. Lobell, D.B., Burke, M.B., Tebaldi, C., Mastrandrea, M.D., Falcon, W.P., Naylor, Sci. 319 607 (2008).
5. T. B. Alam MM, Toriman M, Siwar C, Molla RI, Am. J. Environ. Sci **7**, 178 (2011).
6. A. A. Siwar C, Alam MM, Murad MW, Int. Rev. Bus. Res. Pap. **5**, 309 (2009).
7. R. S. Kurukulasuriya P, Kurukulasuriya P, Rosenthal S **91**, 1 (2013).
8. Y. Suryadi and D. Nugroho Sugianto, Proceeding Biol. Educ. Conf. **14**, 241 (2017).
9. S. Hartini, M. P. Hadi, Sudibyakto, and A. Poniman, Maj. Ilm. Globe **17**, 51 (2015).
10. G. Ouédraogo, M.; Zougmoré, R.; Barry, S.; Somé, L.; Baki, CCAFS Info Note 1 (2015).
11. P. Bourdieu, in (Greenwood Press, New York, 1986).
12. J. Coleman, Am.J.Sociol **94**, (1988).
13. R. Putnam, Am. Prospect **13**, 35 (1993).
14. L. Bezabih, M., Beyene, A.D., Borga, Chang. Econ, Policy **135**, 1 (2013).
15. T. Siregar, P.R., Crane, CAFE 55 (2011).
16. H. Bowles, S. and Gintis, **112**, 419 (2002).
17. D. Woolcock, M., Narayan, World Bank Res **15**, 225 (2000).
18. T. Grootaert, C., & van Bastelaer, Cambridge Cambridge Univ. Press (2002).
19. P. Adhikari, K.P., Goldey, World Dev **38**, 184 (2010).
20. U. Ishihara, H., and Pascual, Ecol. Econ. 1549 (2010).
21. I. Bandiera, O., Rasul, Econ. J **116**, 869 (2006).
22. J. Isham, Econ, J. Afr. **11**, 39 (2002).
23. L. Narayan, D., Pritchett, Econ. Dev **47**, 871 (1999).
24. M. Nam, W.H., Choi, J.Y., S.H., Jang, Paddy Water Env. **10**, 197 (2012).
25. R. Fankhauster, S., Smith, J.B., Tol, Ecol. Econ **30**, 67 (1999).
26. J. Kane, S., Shorgen, Change **45**, 75 (2000).

27. L. Fuks, M., & Chatterjee, J. Urban Plan. Dev. **134(1)**, 42 (2008).
28. K. Markantonis, V.; Bithas, Environ. Dev. Sustain 807 (2010).
29. S. A. and J. Prasmatiwi F E, Irham, J Ekon. Pembang. **12**, 187 (2011).
30. S. Hidayati, I. N., J. Ekon. Dan Stud. Pembang. **16**, 42 (2015).
31. S. Sukarman, M. A., & Purwanto, J. Sumberd. Lahan **12(1)**, 1 (2018).
32. E. Rusminah, R., & Gravitiani, J. Ekon. Stud. Pembang. **13(1)**, 12 (2012).
33. M. Bateman, I., Carson, R., Day, B., Hanemann, M., Hanley, N., Hett, T., Jones-Lee and J. Loomes, G., Mourato, S., Özdemiroglu, E., Pearce, D.W., Sugden, R., Swanson, (2002).
34. S. Cruz, 1 (2007).
35. K. E. Haab, Timothy C. and McConnel, Edward Elgar (2003).
36. P. Le Goffe, J. Environ. Manage. **45 No 4**, 305 (2012).
37. S. Y. Lee, C.K. & Han, Tour. Manag. **23**, pp 531 (2002).
38. J. D. Togridou, A., Hovardas, T., & Pantis, Togridou, A., Hovardas, T., Pantis, J. D., **60**, 308 (2006).
39. T. Wang, Y.M., Elhag, Expert Syst. Appl **32 (2)**, 336 (2007).
40. D. Gujarati, *Basic Econometrics, Fourth* (McGraw-Hill, Singapore, 2009).
41. E. Saptutyningsih and F. Dewi Nurcahyani, E3S Web Conf. **361**, (2022).
42. T. Duffy, KG, Wong, Allyn Dan Bacon, Bost. (2000).