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IDENTIFICATION OF ADAPTIVE CAPACITY ASSESSMENTS TO IMPROVE COLLECTIVE ADAPTATION OF FARMERS TO CLIMATE CHANGE

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ABSTRACT
Collective adaptation is a relevant discussion in association with the limited adaptive capacity of farmers to deal with climate change. This study aims to improve the collective adaptation of farmers through the identification of adaptive capacity assessments. A collective adaptation mechanism in the form of planning for rice planting time has succeeded in reducing the vulnerability of farmers. This study was conducted at a rice production center with a collective adaptation mechanism in Indramayu District, West Java Province, Indonesia. The data were collected using a quantitative method through a questionnaire distributed to 296 farmer respondents and a qualitative method through structured interviews. The observations provided an overview for authors to build structured interviews. The results of the study show that the adaptive capacity of farmers is supported by social capital and collective adaptation mechanisms of farmers consisting of trust in the formal leaders, quality of collective decisions, and planning capacity. The results of this study contribute to the implementation of public policies in order to support the successful implementation of adaptation strategies to deal with climate change in accordance with the needs of farmers.

Contribution/Originality: This study contributes to the implementation of public policies in order to support the successful implementation of adaptation strategies to deal with climate change in accordance with the needs of farmers.

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1. INTRODUCTION
In recent years, studies have shown that farmers face challenges in adapting to climate change. In reality, farmers have limited access in that they experience additional vulnerabilities due to exposure to climate change marked by uncertainties in the rainy season, drought, and changes in air temperature (Sime & Aune, 2019). Despite their awareness of their vulnerabilities due to exposure to climate change, farmers do not necessarily implement

adaptation strategies (Jamshidi, Asadi, Kalantari, Azadi, & Scheffran, 2019). Meanwhile, other studies have shown different results, in which the trust and perception of the risks of climate change encourage farmers to implement adaptation strategies (Azadi, Yazdanpanah, & Mahmoudi, 2019). Furthermore, numerous studies describe adaptation strategies of farmers in dealing with climate change. The adaptation strategies of farmers in South Africa, Kenya, Pakistan, Bangladesh, and Malaysia involve rice varieties tolerant to drought, crop diversification, a planting calendar, water and soil conservation, and organic fertilizers (Ali & Erenstein, 2017). Meanwhile, other farmers implement adaptation strategies by using climate information or farmer insurance and participating in rural communities (Adzawla, Kudadze, Mohammed, & Ibrahim, 2019; Saptutyningsih, Diswandi, & Jaung, 2020).

Adaptability in the face of climate change is crucial for farmers today. Adaptability followed by skills and knowledge can strengthen adaptive decision making that is a characteristic of adaptive capacity (Gardezi & Arbuckle, 2017; Matewos, 2020). The characteristics of adaptive capacity consist of income diversity and flexibility, access to assets, learning and knowledge, and collective organization (Whitney et al., 2017). Adaptive capacity is the capacity of individuals or groups to carry out self-organization. Self-organization, in addition to the diversity of knowledge and learning in the community, produces quality adaptation planning (Folke, Hahn, Olsson, & Norberg, 2005). Collective adaptation mechanisms have the potential to be developed because previous studies have shown that the adaptive capacity of farmers is generally supported by social capital (Abdul-Razak & Kruse, 2017; Chepkoech, Mungai, Stöber, & Lotze-Campen, 2020). Social capital produces collective actions, social networks, and collaborations that affect the level of adaptive capacity of farmers (Freduah, Fidelman, & Smith, 2018). The indicators of social capital as the source of adaptive capacity of the community to deal with climate change are social networks, participatory decision making, and implementation of adaptation in the form of collective actions (Phan, Jou, & Lin, 2019).

Social capital is a positive resource attribute of farming communities with low economic performance. However, several studies show that social capital does not have a positive impact on increase in yield and does not affect individual adaptability (Carrico, Truelove, & Williams, 2019). Meanwhile, other studies show that social capital strengthens community collaboration that affects the sustainability of farmers' livelihood (Asante, Guodaar, & Arimiyaw, 2021). The aspect of collaboration is a conceptual link between adaptive capacity and collective adaptation mechanisms in the context of farmers' livelihood (Djalante, 2012; Folke et al., 2005). The aspect of collaboration also affects adaptation of the agricultural sector in facing climate change (Islam & Nursey-Bray, 2017). The aspect of collaboration can be built presupposing that the performance of formal institutions provides comfort for farmers to be constantly involved in the collective decision-making process (Tesfaye, Hansen, Kassie, Radeny, & Solomon, 2019).

The correlation of social capital in the context of adaptive capacity and collective adaptation of farmers are quite limited. Collective adaptation is a relevant discussion in association with the limited adaptive capacity of farmers to deal with climate change. The adaptive capacity of Indonesian farmers in terms of skills and knowledge has been built through learning obtained from Farmer Field School (Van Den Berg, Ketelaar, Dicke, & Fredrix, 2020). However, the findings of other studies show that the limited capacity of Indonesian farmers results in them being affected by climate change, leading to a decrease in income (Rondhi, Fatikhul Khasan, Mori, & Kondo, 2019) . El-Niño and La-Nina climate changes result in a decrease in agricultural production, thus threatening the food security of Indonesian farmers (Boer & Surmaini, 2020). Therefore, it was essential to carry out this study since it contributes to the novelty of indicators of collective adaptation mechanisms of farmers. This study aims to provide an adaptive capacity assessment of farmers and observe collective adaptation mechanisms. Social capital as an indicator of adaptive capacity becomes the identification to providing understanding and opportunities to improve farmers' collective adaptation mechanisms.

2. MATERIALS AND METHODS

2.1. Location of the Study

This study was conducted in Nunuk Village, Lelea Subdistrict, Indramayu District, West Java Province, Indonesia (Figure 1). The location of the study was chosen purposively due to its characteristics of adaptive capacity, namely the diversity of knowledge from Farmer Field School and Science Field Shops that supports a collective adaptation mechanism in the form of planning for rice planting time (Folke et al., 2005; Whitney et al., 2017).

Climate change is a phenomenon of climate variability including rainfall and air temperature below or above the normal average on a spatial and temporal scale affecting the community life of small farmers. Rainfall data for a period of 30 years are included among the instruments used to determine the occurrence of climate change (IPCC, 2012). Rainfall data for 30 years from Cikedung Rainfall Measuring Station, Indramayu Regency between 1987 and 2017 show that annual rainfall in that period tended to be below normal (1,500 mm). From 2008 to 2017 there were fluctuations in rainfall, with a normal annual rainfall ranging between 1,500 and 2,000 mm. However, in 2015 a drought was indicated by the absence of rainfall for 131 days. Meanwhile, rainfall in 2016 tended to be above normal, reaching 2,436 mm over a total of 136 rainy days. Although the intensity of rainfall varied, farmers' yields were stable in the range of 7–8 quintals per 100 bricks (1,400 m^2) in each cultivation season.

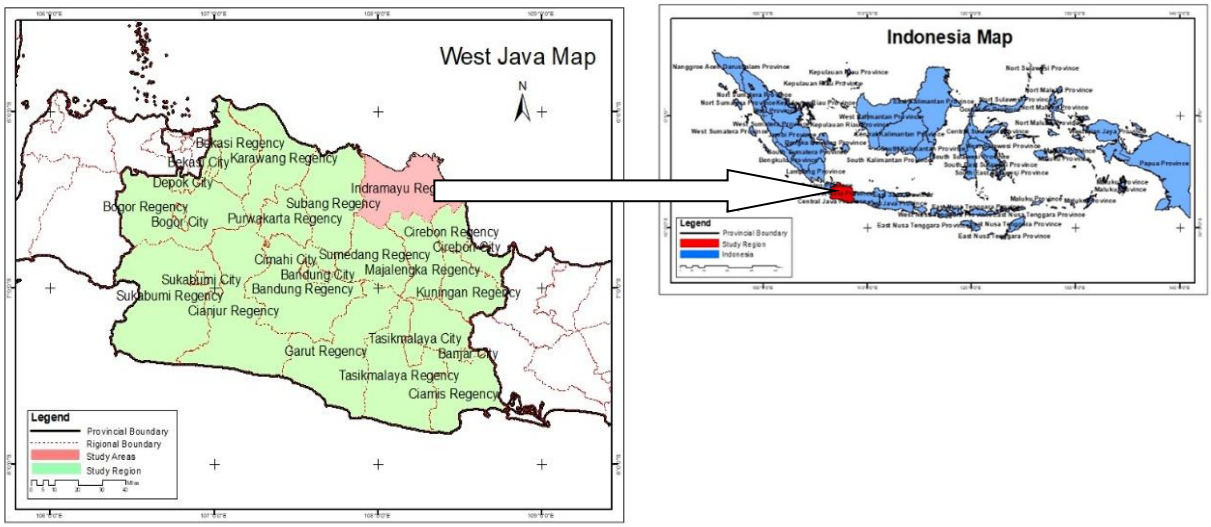

Figure-1. Study location in Nunuk Village, Lelea Subdistrict, Indramayu District, West Java Province, Indonesia

2.2. Data Collection

This research model begins with a quantitative study, followed by analysis of the results and strengthened by detailed explanations through the results of a qualitative study. This research model can provide an understanding of the problem of the study as a whole (Creswell, 2014). The study used the data collection method through questionnaires incorporating a Likert scale with levels of choice ranging from Strongly Agree, Agree, Hesitate, Disagree, to Strongly Disagree, as well as from Always, Often, Sometimes, Rarely, to Never. The sample size was determined using the formula of Lynch et al. with a reliability level of 95%, resulting in a survey sample of 296 farmer respondents (Abdoellah et al., 2020).

Meanwhile, the sampling technique applied for the qualitative study was purposive sampling. Purposive sampling is feasible to use in a study with a qualitative method on a specific case (Neuman, 2014). The informants were selected based on adequate information provided regarding knowledge enrichment for farmers from external parties, and the dynamics in farming communities in building a mechanism for determining collective rice planting time. The informants in this study were 40 individuals including village heads, former village heads, agricultural extension officers, heads of farmers' groups, independent learning farmers, and farmers who had participated in the knowledge enrichment process and were involved in planting time mechanisms.

2.3. Data Analysis

The data obtained from the questionnaire were analyzed using the Smallholder Farmers' Adaptive Capacity Index (SFACI) assessment Table 1 (Abdul-Razak & Kruse, 2017).

Table-1. Criteria for smallholder farmers' adaptive capacity index assessment.

Adaptive capacity level	SFACI score
Very high adaptive capacity	4.01-5.00
High adaptive capacity	3.01-4.00
Moderate adaptive capacity	2.50-3.00
Low adaptive capacity	1.51-2.49
Very low adaptive capacity	0.00-1.50

Meanwhile, data collected from observations and structured interviews were analyzed based on the participation component in the farmers' adaptive capacity index. Farmer participation was the initial analysis used to understand the relationship between the adaptive capacity and social cohesion of farmers faced with social, economic, ecological and political constraints (Vertigans & Gibson, 2020).

3. RESULTS AND DISCUSSION

3.1. Farmers' Characteristics

Farmer respondents were dominated by men, at 83.11%. The dominant age range was 56–65 years (34.46%) (Figure 2). Farming is the main livelihood for the residents of Nunuk Village, and approximately 75% of farmer respondents stated that farming is their only livelihood. Most farmers in Nunuk Village stated that farming is a profession continuing from generation to generation, because they inherited their fields from from their parents.

Figure-2. Distribution of respondents.

3.2. Farmers' Adaptive Capacity Assessment

The assessment of farmers' adaptive capacity in facing climate change consisted of three variables: economic resources, access to knowledge and information, and social capital (Table 2). This assessment was dominated by the low category because the two variables of economic resources and access to knowledge and information showed a low capacity. There was one variable in the moderate category, social capital. Adaptive capacity assessment was an assessment standard that showed the weak adaptive capacity of individual farmers in facing climate change.

Table-2. Index of adaptive capacity of farmers in facing climate change.

Variable	Parameter	Score/category
Economic resources	Land ownership	1.99 (Low)
	Income diversification	1.48 (Very low)
Access to knowledge and information	Level of education	2.16 (Low)
	Knowledge of climate change	1.81 (Low)
	Visits by agricultural extension officers	1.51 (Low)
	Climate information	1.82 (Low)
Social capital	Participation	2.52 (Moderate)
	Group learning	2.71 (Moderate)

3.3. Economic Resources

The first variable in the farmer's adaptive capacity index was economic resources, which consisted of two parameters, i.e., land ownership and income diversification (Table 3). The majority of farmers' land ownership was under 0.25 ha (39.5%). Generally, farmers who owned land under 0.25 ha had a rice field area of between 100 and 200 bricks (1,400–2,800 m²). Farmers who had rice fields under 0.25 ha became farm workers on other farmers' land at harvest time. This activity aimed at increasing farmers' income because the harvest cannot meet their needs, whereby they are obliged to pay debts and fulfill social obligations in the village areas. Apart from farmers' limited ownership of rice fields, around 79% did not have other sources of income. The farming profession is a hereditary profession from generation to generation in Nunuk village, and livelihood as a farmer is an identity for the residents. In fact, some farmer respondents stated that they had migrated to cities to gain a higher income and have additional capital to purchase agricultural land and increase the area of land owned.

Table-3. Index of adaptive capacity the variable of farmers` economic resources in facing climate change.

Parameter	Value/indicator	%
Land ownership	<0.25 ha	39.5
	0.25–0.99 ha	29.1
	1–2 ha	23.6
	3–4 ha	5.1
	>4 ha	2
Income diversification	Farming	79
	Farming and owning other businesses	4
	Farming, owning a business, and working part time	11
	Farming and working professionally	1
	Farming, working professionally, and having a wife owning a business	13

3.4. Access to Knowledge and Information

The second variable of farmers' adaptive capacity was Access to Knowledge and Information, which consisted of four parameters (Table 4). The first parameter was the education level: farmers generally did not graduate from elementary school (up to 37.8%). Most of the farmers who did not graduate from elementary school could neither read nor write. The second parameter was access to knowledge on climate change, which was

dominated by 46% of farmers. Twelve farmers who had gained knowledge of climate change were measuring rainfall, most of whom did not put their knowledge into practice in day-to-day farming. Then, 66% of farmers did not have access to visits by agricultural extension officers and 67% did not obtain climate information. Farmers who gained access to agricultural extension were those who had a relative relationship with agricultural extension officers. In addition, farmers did not obtain climate information from the authorities: those who obtained climate information were farmers who measured rainfall and acquired information from scientists.

Table-4. Index of adaptive capacity of farmers` access to knowledge and information in facing climate change

Parameter	Value/indicator	%
Level of education	Did not graduate from elementary school	37.8
	Graduated from elementary school	31.1
	Graduated from middle school	12.8
	Graduated from high school	14.2
	Graduated from higher education	4.1
Access to knowledge on climate change	None	46
	Social media	19
	Information from knowledgeable farmers	37
	Information from mass media	23
	Knowledge enrichment	22
Access to visits by agricultural extension officers	None	66
	1 time	19
	2 times	11
	3–4 times	3
	5 times	1
Access to climate information	No information	67
	Information from internal network	4
	Information from the internet	14
	Information from farmers who are active in learning	3
	Information from scientists and authorities	12

3.5. Social Capital

Farmers' participation in village deliberations to determine planting time, and participation in group learning, were two parameters in the social capital variable (Figure 2). The first parameter was participation which showed that 22.30% of farmers were often involved in joint decisions because they received the benefits of discussions with other farmers who measured rainfall. Likewise, implementation of joint decisions was often followed by 30.74% of farmers. This was because joint decisions provided benefits for farmers in planning rice planting so as not to fail at harvest time. Meanwhile, 43.92% of farmers rarely participated in pest eradication programs on rice plants because most preferred to conduct their own schemes independently. In addition, 35.47% of farmers had never participated in agricultural training activities because they did not participate in farmer groups or other farmer organizations and so they did not gain access to knowledge.

The second parameter was group learning, which was started by the dominance of 45.61% farmers who never recorded the conditions of soil, water, and pests. It was different for farmers who had received knowledge enrichment. Farmers attending Science Field Shops had the habit of making observations in rice fields and taking notes. Then, 28.04% of farmers stated that they often discussed the recorded results. Such discussions became additional learning for farmers because they absorbed information and experiences from other farmers. However, 36.49% of farmers rarely shared discussion and knowledge enrichment results because they were of the opinion that schemes derived from knowledge enrichment were not practical and efficient in their day-to-day farming practices. However, 34.12% of farmers stated that discussions with fellow farmers always brought benefits of solutions in dealing with agricultural problems.

Based on the parameters of participation and group learning, the authors explored the existence of a collective adaptive mechanism which was a legacy of farmers' learning after the Farmer Field School in 1998. This mechanism was formally institutionalized by village officials and farming communities and became a tradition before each rice planting season twice per year.

3.6. Collective Adaptation Mechanisms

The results of the assessment of the adaptive capacity of farmers highlight the adaptability of individual farmers in the face of climate change. Meanwhile, based on the results of observations and in-depth interviews with farmer informants, there are three findings that indicate the collective adaptation mechanisms of farmers. These three findings are related to the results of the assessment of adaptive capacity in terms of social capital.

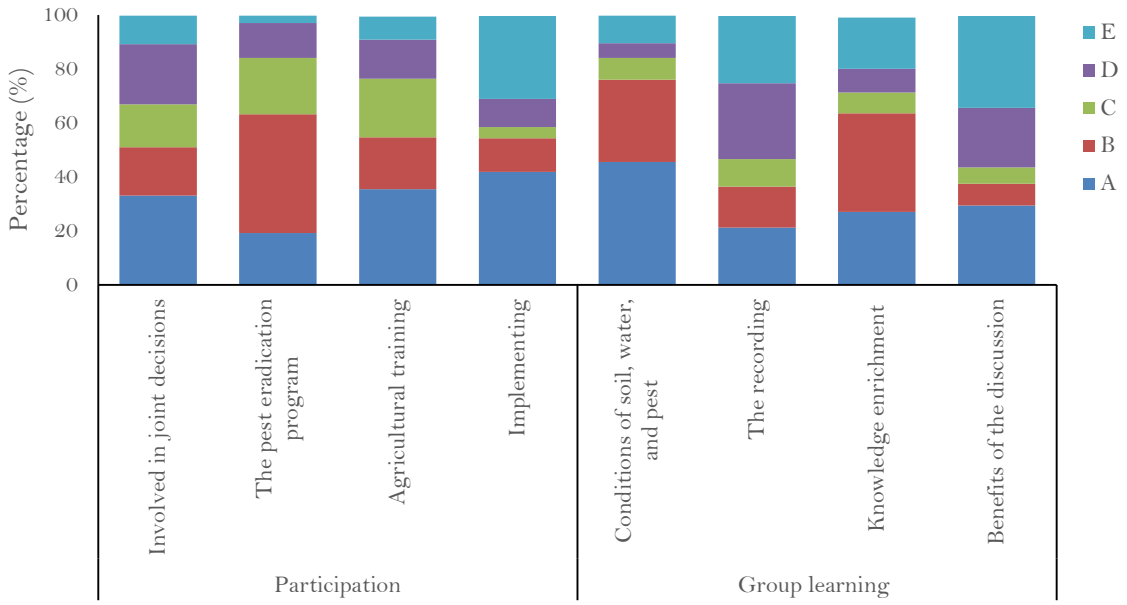

Figure-3. Index of adaptive capacity of farmer`s social capital in facing climate change (A = Never, B = Rarely, C = Sometimes, D = Often, E = Always).

Finding 1: Trust in Formal Leaders

The mechanism for making a joint decision to determine rice planting time has been established by a formal leader and conducted since 1998. The idea started with the knowledge enrichment obtained from Farmer Field School held from 1996 to 1998. Knowledge enrichment instilled the principles of integrated pest management, followed by skills in observing and formulas for calculating pest life cycles. These skills provide an anticipatory action for farmers to determine the right time for planting season that does not coincide with the peak of pest life cycles. The formal leader viewed this skill as important and established this as a formal village tradition prior to the rice planting season. This collective mechanism has experienced dynamics since the change in the political structure in Indonesia in 1998. National political dynamics are marked by regional autonomy, followed by elections for regional heads and village heads. Village heads are formal village leaders. Election of the village head as a democratic party is marked by the dichotomy between supporters of the candidates for the village head in the farming community. It certainly affects activities in the village. Farmers supporting the elected village head will participate in those activities. Meanwhile, farmers who are not become passive parties in various activities in the village. Figure 2 shows participation in collective activities including those used to determine the planting time, where 33.11% farmers never participate and 22.30% farmers admit to participating often. Generally, farmer respondents who never participate give two reasons. The first reason is political, since they do not support the village head. The second reason is that they do not have adequate knowledge, leading them to observe the collective mechanism as one that does not provide benefits to them. In addition, farmers who do not have adequate knowledge are pessimistic about the efficacy of collective activities in increasing farm productivity. Referring to the in-depth interviews with farmer respondents and informants, the formal leader who created the mechanism for determining collective planting time is an ideal leader. This leader frequently took the initiative and directly mobilized farmers to participate in water and soil conservation in paddy fields. Furthermore, this leader was able to reduce the dynamics of conflict in the village. This leader embraced even groups of non-supporters in the election of village head. Therefore, this leader was the individual most mentioned by farmer respondents as one with a positive contribution to agricultural development in the village. In addition, by mobilizing the participation of farmers, they were involved in the mechanism and implementation of rice planting time as decided. Meanwhile, the farming community currently does not follow the recent decision on collective rice planting time. Those who are not supporters of the active village head are not encouraged to be active in village activities and participate in collective planting times. On the other hand, the active village head does not try to embrace them.

Finding 2: The Quality of Collective Decisions

The collective decisions in determining planting time derive from the process of observing pests and diseases in rice plants, as well as rainfall, by knowledgeable farmers. Knowledgeable farmers are those who have attended Farmer Field School or Science Field Shops. The results of observations by knowledgeable farmers are complemented by information on the adequacy of water in irrigation canals by water observers from the government, as well as climate scenarios provided by scientists. The results of these observations and information produce quality collective decisions as they provide an anticipatory action, allowing farmers to plant rice based on the adequacy of irrigation canals and to avoid planting rice during the peak of pest life cycles. Thus, the quality of collective decisions is appropriate and accurate according to the needs of farmers. As stated by farmer respondents and informants, collective decisions have succeeded in preventing crop failure since 1998.

Finding 3: Planning Capacity

The quality of collective decisions is supported by adequate planning capacity. This planning capacity is indicated by the knowledge and skills practiced by knowledgeable farmers. The number of knowledgeable farmers is quite limited in the village, but they are able to act strategically for collective mechanisms. Not all knowledgeable farmers practice and contribute to the mechanism of collective rice planting time: several carry out their roles as planners. The mechanism for determining planting time will not be sustainable supposing it is not supported by the presence and contribution of the planners. They observe both pests and rainfall periodically. Another factor that supports planning capacity is an information network maintained by planners. They obtain climate information from scientists to complement the results of observations. In addition, the village apparatus builds a network with the local government. Additional information regarding the availability of water discharge in irrigation canals is another good consideration used to determine planting time. The capacity of the planners and the officials of village institutions build collaborative and responsive village institutions to deal with climate change.

This study shows that economic resources and access to knowledge and information are not reliable in providing adaptation actions for individual farmers. The low economic resources of farmers caused farmers not to have the adaptive capacity in facing climate change (Antwi-Agyei, Dougill, Stringer, & Codjoe, 2018). In addition, farmers did not acquire additional capacity to access economic resources in the form of financial access such as farming credit, market access, and agricultural subsidies (Jamshidi et al., 2019). In addition to the weak economic resources of farmers, they also did not have access to adequate knowledge and information in building their capacity. Four parameters in access to knowledge and information indicated that the state did not build the human resource capacity of farmers. Access to knowledge on climate change and agricultural extension services covered a small number of farmers, so that the distribution of knowledge in the farming community became unequal. In addition, farmers were not provided with climate information by the authorities so that they could provide additional capacity in developing adaptation strategies. Based on the findings of previous studies, access to agricultural extension services is a significant factor in supporting the adaptive capacity of farmers (Chepkoech et al., 2020). In addition to the limited access to agricultural extension, the proportion of farmers obtaining knowledge enrichment on farming and climate change is also limited. Thus, only knowledgeable farmers can develop adaptation strategies for themselves and contribute to the community. Access to knowledge for farmers requires government policy interventions that can focus on building resilience for farmers to face climate change (Maltou & Bahta, 2019). Although farmers' access to knowledge was limited, two forms of knowledge enrichment, from Farmer Field Schools and Science Field Shops, had succeeded in building the planning capacity of farmer communities in facing climate change (Van Den Berg et al., 2020). The social capital observed in this study consists of two indicators, namely participation and group learning, that are in the category of moderate. Group learning is influenced by access of farmers to knowledge. Farmers without access to knowledge show low awareness of making independent learning efforts through observation and recording activities in paddy fields. In addition, they do not view discussion as a way to increase their knowledge. However, the findings of this study indicate that the participation of the farming community is not solid but is divided, due to their trust, or lack of trust, in formal leaders. Trust in formal leaders can have a positive effect, namely a high level of participation by farmers in collective mechanisms. On the other hand, participation, trust, and involvement and harmonious personal relationships in the community can build relevant social capital in the context of adaptation to climate change (Saptutyningsih et al., 2020). Participation influences the quality of decision-making and planning capacity, the resources for formal institutions (Whitney et al., 2017).

Formal institutions that preserve collective adaptive mechanisms can build farmer adaptation based on the findings of this study. It confirms the findings of previous studies that formal institutions provide agricultural practices that are adaptive to climate change (Abdul-Razak & Kruse, 2017). However, adaptation mechanisms face dynamics because formal relations and institutions face contexts outside the phenomenon of climate change, namely political factors that affect interactions among farmers. The mechanism for determining planting time requires formal institutions. However, formal institutions require the active role of groups of actors in building agricultural capacity of adaptation strategies in farming (Islam & Nursey-Bray, 2017). This study shows that formal institutions perpetuate collective adaptation mechanisms. It is indicated by the awareness of the formal leader who applied knowledge of integrated pest management as the basis for building adaptation strategies. The knowledge of integrated pest management from Farmer Field School is proven to be able to build farmers' adaptive behavior (Van Den Berg et al., 2020). Furthermore, learning from Farmer Field School is determined by the formal leader as an adaptation strategy that is supported by knowledgeable farmers and sources of information from farmer networks. The availability of resources increases the readiness and response of the communities in adaptation (Djalante, 2012).

The adaptation mechanism is also followed by the fundamentals derived from the knowledge obtained from Science Field Shops that is accommodated by the active formal leader as part of the instrument to increase the accuracy of rice planting strategy. However, the distribution of knowledge from Science Field Shops to farmers was limited so that it did not provide sufficient knowledge on climate change to individual farmers. Nevertheless, this mechanism shows the characteristics of adaptive capacity due to the diversity of sources of knowledge and information that increase adaptability (Whitney et al., 2017). This study is in line with the findings of a study in Bangladesh, that quality knowledge can encourage appropriate and responsible efforts and actions for community adaptation (Haque, Bremer, Aziz, Bin, & Van Der Sluijs, 2017). Collective adaptation mechanisms have indicators of diversity of knowledge and sources of information that support the adaptability of farmers in determining rice planting time. However, this adaptation mechanism needs improvement in order to survive and be sustainable.

The findings of the study show that the specific indicators of collective adaptation mechanisms of farmers are leaders with a sustainable vision and quality planning capacity. Adaptive capacity is a system device that can enable

actors to adapt (Dixon, Stringer, & Challinor, 2014) or the capacity of social unit system, either individuals or communities. This study shows that adaptive capacity is a set of systems that can provide choices of adaptation actions to social actors, one of which is social capital. Social capital can provide farmers with choices to become adaptive to climate change through individual relations in collective action, in the form of participation. However, this participation requires support to build collaboration as a requirement for building collective adaptive mechanisms. Leaders with a sustainable vision are indicators to build group collaboration. Leaders with a sustainable vision view planning capacity of farmers to be built through the fundamentals of knowledge (Chingombe & Musarandega, 2021). Leaders play an important role in building the community adaptive capacity in the form of legitimacy, responsiveness, and accountability (Nkiaka & Lovett, 2019). In addition, leaders with a sustainable vision can mobilize the participation of farmers to engage in collective adaptation mechanisms by dismissing differences in political views. Leaders with a sustainable vision are able to build collaborations with knowledgeable farmers to ensure that the learning obtained from knowledge enrichment remains the foundation for collective adaptation planning. Another indicator found in this study is that quality planning capacity needs to be supported by the capacity of planners and farmer networks. In this study, knowledgeable farmers or those who have gained knowledge enrichment and practice their knowledge become the central figures in the mechanism of determination of rice planting time (Otsuki, Jasaw, & Lolig, 2018). They use their skills to observe the life cycle of pests and analyze rainfall conditions based on the results of daily records. These two skills provide the capacity to anticipate crop failure. The capacity of farmers is also complemented by the existence of an external network that provides information that increases the capacity of farmers. An external network from academia provides information on climate change and climatic conditions. Therefore, adaptation planning capacity is fundamentally derived from quality knowledge and is practiced by farmers with the capacity and appropriate sources of information (Haque et al., 2017)

4. CONCLUSION

The adaptive capacity of individual farmers is dominated by the low criteria of economic resources and access to knowledge and information. However, social capital in the moderate criteria has the potential to be improved. The indicator of participation in social capital shows the dynamics of interaction in farming communities. This indicator plays a role in maintaining a collective adaptation mechanism in the form of determining rice planting time. The collective adaptation mechanism is an institutional set consisting of the trust of farmers in formal leaders, quality of collective decisions, and planning capacity. Leaders with a sustainable vision are able to build collaboration between farming communities to perpetuate collective adaptation mechanisms. Meanwhile, the capacity for quality adaptation planning is supported by the capacity of planners and a network of farmers with credible sources of information. In addition, the results of this study contribute to the implementation of public policies in order to support the successful implementation of adaptation strategies to deal with climate change in accordance with the needs of farmers.

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