



Education and Action Movement of Climate Smart Agriculture Farmers: Adapting and Mitigating the Impacts of Climate Change on Agricultural Peatland in Perigi Village

Dessy Adriani^{1*}, Muhammad Yazid¹, Muhammad Yamin¹, Muhammad Andri Zuliansyah², Serly Novitasari¹, Siti Ramadhani Andhelia¹, M. Huanza¹, Dini Damayanthi¹, Trisna Wahyu Swasdiningrum Putri¹

¹ Agribusiness Department, Agriculture Faculty, Universitas Sriwijaya, Indralaya, Indonesia.

² Agronomy Department, Agriculture Faculty, Universitas Sriwijaya, Indralaya, Indonesia.

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Corresponding Author: Dessy Adriani

Dessy Adriani

dessyadriani@unsri.ac.id

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Abstract: The agricultural sector's sustainability is seriously threatened by climate change, especially in vulnerable places like Perigi Village, which is primarily made up of peatlands. Due to a lack of knowledge about climate change adaptation and mitigation, farmers face decreasing productivity, seasonal uncertainty, and the risk of land fires. Through training, outreach, technical support, and the use of basic technologies based on climate-smart agriculture, the Climate-Smart Agriculture Farmers Education and Action Movement programme seeks to increase farmer capacity. Extension, hands-on training, agrosilvofishery systems, educational media, and the formation of Climate-Smart Agriculture Farmers Groups are some of the techniques employed. The program's results demonstrate a significant increase in farmer knowledge, the ability to apply adaptive techniques, and the creation of regional organisations that support collective efforts to reduce climate risks. This activity has an educational, social, ecological, and economic impact on the community and can be replicated as a model for village empowerment. This curriculum emphasises the importance of collaboration between academics, village administrations, and farmers in order to create sustainable agriculture and community resilience to climate change.

Keywords: Agrosilvofishery, Community Empowerment, Community Group, Resilience.

Introduction

Perigi Village, located in South Sumatra and part of the Sriwijaya University development program, primarily relies on agriculture, specifically rubber and horticulture. The agricultural sustainability in the area is threatened by climate change effects, including uncertain planting seasons, rising temperatures, altered rainfall patterns, and increased extreme weather events like droughts and floods, which adversely affect productivity and food security for the local farmers Perigi (E. P. Ema et al., 2024; E. pusvita Ema et al., 2023)

Perigi Village is situated in an ecologically vulnerable region facing significant environmental degradation. South Sumatra contains about 1.28 million hectares of wetlands, but around 780,000 hectares (60%) have suffered degradation, mainly influenced by frequent land fires during the dry season. The severe fires in 2015, impacting 2.6 million hectares across Indonesia, highlighted the urgent issues of climate change and land degradation in this area (Adriani et al., 2024; Choi et al., 2024).

The main issue for farmers in Perigi Village is their limited understanding of climate change and its implications for agriculture. Most farmers lack

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knowledge about climate change, its effects, and how to adapt or mitigate these impacts. This insufficient understanding decreases their ability to cope with climate-related risks, leading to problems such as crop failures from drought, increased pest infestations, and flooding that harms crops (Adriani et al., 2024; Goib, 2019).



Figure 1. Peatland Conditions in Perigi Village

On the other hand, access to information and technical training on adaptive agricultural practices is very limited. Support systems at the village level that provide education and guidance to farmers are lacking, and there are no farmer movements or institutions addressing climate change issues. As a result, farmers operate individually and reactively, without a structured and sustainable long-term strategy (Samsudin et al., 2020; Vall-Casas et al., 2024).

The Climate-Smart Agriculture Farmers Education and Action Movement" targets farmer groups in Perigi Village reliant on rubber and palm oil in peatland areas. These farmers employ conventional agricultural methods that neglect climate change adaptation and the sustainable management of peat ecosystems. Their situation is worsened by a lack of knowledge on conservation, overuse of chemical fertilizers, and limited access to technology and markets, increasing their vulnerability to extreme climate conditions (Biancalani, 2014; Massimo Lupascu, 2023; Wetlands International, 2019). Lack of understanding of conservation techniques, reliance on chemical fertilizers, and limited access to technology and markets heighten farmers' economic and ecological vulnerability in the context of extreme climate change (Makate et al., 2019; Sarkar et al., 2020).

Integrated efforts are crucial to enhance farmers' ability to adapt to and mitigate climate change. The "Climate-Aware Farmers Education and Action Movement" program aims to educate farmers about climate change through training, focus group discussions, and accessible visual media. This education will include practical assistance using climate-resistant plants, soil and water conservation techniques, and

diversifying agricultural business aligned with local potential (Makate, 2019; Salerno et al., 2022).

This activity supports the Sustainable Development Goals (SDGs), focusing on SDG 2 (Zero Hunger), SDG 13 (Addressing Climate Change), and SDG 15 (Terrestrial Ecosystems), by promoting local food security, community-based climate actions, and ecosystem conservation. It also aligns with the university's Key Performance Indicators related to lecturers' off-campus activities and community engagement (Kemdikbudristek, 2021).

Within Sriwijaya University's "Excellent and Competitive Mentored Village" program, this activity aims to address real-world problems in rural communities through scientific contributions. It embodies five behaviors of the Impactful Diktisaintek: responsiveness to community needs, stakeholder collaboration, innovative mentoring methods, sustainable village development, and community empowerment to tackle climate challenges. By adopting a holistic approach that combines education, collective action, and institutional strengthening, this initiative seeks to enhance Perigi Village farmers' awareness and capacity to combat climate change, improve agricultural productivity, and promote ecological awareness, ultimately fostering a resilient village community.

This activity seeks to enhance the adaptive capacity of farmers in Perigi Village to climate change through an educational and participatory approach. Its objectives include: 1) Increasing understanding of climate change and its agricultural impacts, along with adaptation strategies; 2) Improving technical skills in climate-smart agriculture (CSA) practices suited for peatlands; 3) Fostering a climate-conscious farmer organization for collaboration; 4) Building commitment to sustainability in agricultural practices; and 5) Producing educational outputs like a "Climate-Smart Agriculture Farmers" pocket book, videos, and scientific articles for broader reference and replication.

Method

1. Methods and Activity Model

The activity model for this Community Empowerment Programme (PPM) activity consists of a number of steps. The first is problem description, which entails determining the challenges that farmers face based on past research with CIFOR-ICRAF and an analysis of local conditions. After that, outreach is carried out via in-person meetings and visual media to provide people a basic awareness of climate change and its effects. The second level is training, which provides technical resources on climate-resistant cultivars, water conservation, ecologically friendly farming methods,

and adaptive farming techniques, ranging from theory to field practice.

They apply the model then proceeds to the use of technology, specifically the introduction and implementation of Agrosilvofishery (ASF) as an adaptation solution that encompasses agroforestry, silvopasture, and aquaculture. Farmers are provided with training and direct mentoring in the use of appropriate technology. The next stage is mentoring and evaluation, which involves regular monitoring to ensure adaptation practices are implemented appropriately and to assess their results and impacts. The creation of a climate-conscious farmer group as a local institution that will sustain the ongoing independent implementation of climate change adaptation in Perigi Village is the model's last step, programme sustainability.

2. Methods for Implementing Community Service

The implementation techniques for this Community Service Programme (PPM) project include outreach through direct outreach assisted by climate experts, posters, and educational videos to raise farmer awareness about climate change. Training aimed at enhancing farmers' skills in resource conservation, adaptation strategies, and climate-friendly farming practices comes next.

Technology implementation is then applied by providing technologies such as weather applications and appropriate tools that support adaptive agriculture. Additionally, the programme makes use of evaluation and mentoring techniques, offering frequent evaluations and intense coaching to guarantee successful application of solutions in the field.

The establishment of climate-conscious farmer groups provides a forum for building collective capacity in order to guarantee sustainability. Additionally, farmers can study handbooks that offer helpful advice on their own. Focus Group Discussions (FGDs) are used at some points to get direct feedback and viewpoints from farmers about problems and solutions that are most appropriate for the local environment.

3. Target Audience

The target audience for this community service activity is the Agrosilvofishery Farmers Group in Perigi Village, Pangkalan Lampan District, Ogan Komering Ilir Regency, who are expected to transfer their knowledge to other farmers.

4. Design and Evaluation

The evaluation of the Climate-Aware Farmers Education and Action Movement was conducted to assess the effectiveness of the program's implementation in increasing farmers' adaptive capacity to climate change in Perigi Village. The evaluation was conducted

quantitatively and qualitatively, with several main indicators:

- Increased farmer understanding
- Farmer willingness to form Climate-Smart Groups
- The sustainable institutionalization of these groups

For several main indicators above, we also have several steps:

a) Evaluation of Improved Farmer Understanding

This stage was conducted through pre- and post-tests on participants before and after the training and mentoring activities. The evaluation instrument was a questionnaire that measured farmers' understanding of the basic concepts of climate change, adaptation and mitigation strategies, and the application of climate-smart agriculture techniques.

The evaluation results were compared using descriptive statistical analysis and paired t-tests to determine significant improvements in participants' understanding. This method aligns with the participatory evaluation approach recommended by the FAO (2016) in Climate Change and Food Security: Risks and Responses, which emphasizes the importance of measuring farmers' knowledge before and after training to identify improvements in their adaptive capacity.

b) Evaluation of Farmers' Willingness to Form Climate-Smart Groups

This evaluation aimed to determine the level of farmers' willingness to participate in forming new social institutions oriented towards climate change adaptation. The evaluation was conducted through focus group discussions (FGDs), in-depth interviews, and observations of social dynamics and farmer motivations.

This approach follows the Community-Based Adaptation framework (Pearce-Higgins et al., 2022; Peterson St-Laurent et al., 2022; Reed et al., 2013), which emphasizes that the success of community-based adaptation is determined by the willingness of community members to collaborate within a shared framework. Factors such as social trust, support from extension workers, and perceived program benefits are identified as key determinants of collective farmer willingness.

c) Evaluation of the Formation of Climate-Smart Groups

The final indicator of the activity's success is the formation of Climate-Smart Agriculture Farmer Groups as local institutions that function to independently continue climate adaptation and mitigation activities.

The evaluation is conducted by assessing: (a) The existence of a clear group organizational structure, (b) The implementation of internal group activities (meetings, tree planting activities, or the use of organic

fertilizer), (c) the commitment of members to the sustainability of activities. Institutional success is assessed through an institutional sustainability assessment approach (Gunawan, 2018; Makate, 2019; Purnomo et al., 2024), focusing on independence, member participation, and the group's ability to access external support (extension workers, village government, or universities).

Result and Discussion

A. Result

This community service activity consisted of several planned stages. It began with a coordination meeting on September 20, 2025, where objectives and tasks were agreed upon. Preparation for implementation occurred on October 4, 2025, involving logistics and material readiness. The main activity took place on October 22, 2025, which included outreach, training, and mentoring. Follow-up consultations were held on November 8, 2025, to assess results and address community challenges. An evaluation on November 15, 2025, assessed effectiveness, achievements, and provided recommendations for future improvements, ensuring sustainable community benefits.

1. Coordinate activity plans (September 20th, 2025)



Figure 1. Initial Coordination of Activities

The proposing team designed a simple climate-based socialization and technology implementation program for rice farmers in peatland areas, specifically in Perigi Village. The discussion was held by the proposing team and farmer representatives on September 20th, 2025 (Figure 1). The technology to be introduced includes a smartphone-based micro-weather detection system, the creation of a climate change-adaptive planting calendar, and training on accessing climate information thru weather applications and online platforms. Additionally, A Climate-Smart Agriculture Movement will be formed as a learning

community for farmers to understand weather patterns, mitigate the risk of crop failure, and learn techniques for dealing with extreme conditions in peatland related to (Massimo Lupascu, 2023; Sarkar et al., 2020).

2. Preparation for implementation (October 4th, 2025)

The approach used to address partner issues is participatory and transformative, focusing on increasing farmer capacity thru training, appropriate technology, and ongoing mentoring. In this case, the Climate Change Education Pocketbook will be compiled to provide an understanding of climate change, its impact on agriculture, and applicable adaptation methods.

This book also educates farmers about Agrosilvofishery (ASF), which is a combination of agroforestry, silvopasture, and aquaculture as an adaptation solution to address climate change. By adopting the ASF method, unproductive farmers can increase their income and contribute to the restoration of peatlands for long-term sustainability. The formation of climate-conscious farmer groups will also be carried out to strengthen collaboration in implementing this solution.



Figure 2. Preparation of Implementation

During the preparation phase for the activity, the team compiled technical and administrative requirements, coordinated with local stakeholders, and developed outreach and training materials. Field inspections were conducted to assess the demonstration site and ensure availability of necessary resources. (Gunawan, 2018; Vall-Casas et al., 2024) stated that internal team meetings would facilitate task distribution and planning, establishing a foundation for effective implementation aimed at benefiting the target farmers.

3. Implementation (October 22nd, 2025)

The implementation phase of the service activity will be held on October 22nd, 2025, as the core of the series of farmer empowerment programs in facing climate change (Figure 3). On that day, the implementing team, along with village officials and farmers, held activities directly at the agreed-upon location. The activity began with an opening by a village representative and an explanation of the program's goals and benefits, ensuring participants understood the

context and direction of the activities they would be participating in.

Next, the team provided socialization materials on the impact of climate change on the agricultural sector and various adaptation strategies that can be implemented.

The material was presented using visual media and direct interaction to make it easier for participants to understand. After the socialization session, the activity continued with technical training in the field, which included demonstrations of adaptive farming practices, introduction to environmentally friendly agricultural technologies, tools, and techniques.

Participants are actively engaged in practice sessions, directly trying out the techniques taught with guidance from the expert team. The event atmosphere was participatory, with discussions, Q&A sessions, and the sharing of experiences between farmers and the implementing team. The implementation of this activity is an important moment to ensure that knowledge transfer can occur directly and practically, so that farmers are able to understand and apply climate adaptation techniques on their land.



Figure 3. Stages of Implementation

The event was participatory, marked by discussions, question-and-answer sessions, and sharing of experiences among farmers. At the conclusion of the event, the farmers unanimously agreed to form a new farmer group called "Perigi Cerdas Iklim." This group is designed to serve as a forum to continue, develop, and maintain the sustainability of the climate change adaptation practices they have learned.

4. Consultation and mentoring (November 8, 2025)

On November 8, 2025, a consultation and mentoring phase followed a community service activity, focusing on applying climate change adaptation techniques by farmers. The team engaged in discussions, field observations, and consultations to address challenges faced by farmers in implementing adaptive agriculture and agrosilvofishery practices. Positive progress was noted in farmers' understanding and confidence, which enhanced their capacity to plan future actions. Active participation from farmers in Perigi Village was emphasized as essential for fostering ownership and responsibility for the program's success.

The signing of the "Perigi Cerdas Iklim" Farmers Group Minutes marks the group's official establishment, witnessed by Agricultural Extension Officers and representatives from the Agricultural Extension Agency.



Figure 4. Consultation and Mentoring Stages

The group's strategic objectives include facilitating climate-adaptive agricultural practices, enhancing collaboration among farmers, acting as a government partner for training access, and ensuring the sustainability of climate adaptation programs. Based on (Bhandari, 2013; Laetitia & Amolo, 2025), this initiative could foster practical knowledge and institutional support for sustainable agriculture in Perigi Village.

5. Evaluation and Monitoring (November 15th, 2025)

Activity evaluation and monitoring involves periodic evaluations conducted pre-program, during, and post-program using tools such as questionnaires, visual observations, focus group discussions, and in-depth interviews (Figure 5).

Sustainability is bolstered by a climate change adaptation guidebook, a leaflet, a short video, commitment from a "climate-conscious farmers" group, and ongoing coordination with extension workers and the village government.



Figure 5. Activity Evaluation Stages

The evaluation results indicate that two indicators related to farmers' understanding of climate change—Awareness and Initial Knowledge, and Perception of Adaptation and Mitigation Solutions—fall in the Uncertain category, reflecting a lack of strong belief or understanding of climate change concepts and solutions. In contrast, the Perception of Climate Change Impact indicator scored Agree, suggesting farmers recognize

the tangible effects of climate change. The overall score of 29.05, also categorized as Uncertain, highlights the ambiguity in farmers' perceptions of climate change issues. These findings emphasize the necessity for enhanced education focused on fundamental knowledge and practical solutions.

Table 1. Pre Test and Post Test

No	Indicator	Pre Test	Post Test
1	Perceptions of Prior Awareness and Knowledge	8.1	11.85
2	Perceptions of Climate Change Impacts	11.05	12.05
3	Perceptions of Adaptation and Mitigation Solutions	9.9	12.65
Total*		29.05	36.55

Note: * significant differences at $\alpha=0.05$ based on t-test for dependent sample

The post-test (Table 1) results revealed that three indicators—Awareness and Initial Knowledge, Perception of Climate Change Impacts, and Perception of Adaptation and Mitigation Solutions—received average scores in the Agree to Strongly Agree categories. The highest score was in the perception of adaptation and mitigation solutions (12.65, Strongly Agree), indicating a strong acceptance and understanding among farmers of the proposed solutions. Conversely, the awareness and initial knowledge indicator had a lower average score (11.85, Agree), suggesting good but less robust comprehension amongst farmers. The overall total score of 36.55 (Agree) reflects improved understanding following the program, particularly regarding climate change mitigation and adaptation. Nonetheless, the score differences highlight the need for enhanced awareness and initial knowledge to better align farmers' understanding with their enthusiasm for the solutions offered as stated (Hu et al., 2022; Pagdee et al., 2006).

6. Sustainability of Activities



Figure 6. Sustainability of Activities

In addition to written evaluations, field visits were also conducted to assess the level of farmer adoption of climate-smart agriculture. These visits served as a form of support for farmers implementing the agrosilvofishery climate-smart farming model.

Examples of climate change adaptations undertaken by farmers include: (1) rice cultivation without burning, demonstrated by farmer participation in preparing rice seedlings for later transplanting to the fields; (2) preparation of fish ponds; and (4) maintenance of fruit trees and forests, as shown in Figure 6.

B. Discussion

The community service activities in Perigi Village established a mentoring process that enhanced farmers' capacity to combat climate change impacts. Through identifying problems, outreach, training, and consultation, farmers improved their understanding of climatic risks and resilient agricultural practices. Training sessions combined theory with hands-on practices like agrosilvofishery and water conservation, resulting in heightened farmer participation and acceptance of adaptive methods. This is related to (Goonesekera & Olazabal, 2022; Salminah et al., 2021) A major outcome was the formation of the "Perigi Cerdas Iklim" farmer group, fostering collaboration and knowledge sharing. However, challenges remain, such as varied literacy levels and technological access among farmers. The same challenges also faced by (K. et al., 2018; Wildayana & M. Edi Armanto, 2018) Continued mentoring, strengthening of the farmer group's organizational structure, and collaboration with external partners are essential for the program's sustainability and replication as a model for climate-smart agriculture in similar regions.

Conclusion

The Perigi Village Climate-Aware Farmers Education and Action Program has effectively increased farmers' knowledge of climate change, its impacts on agriculture, and relevant peatland adaptation and mitigation techniques. Farmers demonstrated increased knowledge, technical skills, and a shared commitment to creating climate-smart agricultural practices through outreach, training, mentoring, the use of basic technology, and the formation of local institutions. Key achievements that support the sustainability of the agricultural ecosystem in Perigi Village and increase farmers' resilience to climate risks include the formation of a Climate-Aware Farmers Group, the implementation of adaptive techniques, and the availability of educational media and handbooks.

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