International Journal of Research in Interdisciplinary Studies
Volume 4, Issue 11, November 2026
www.ijris.com | E-ISSN: 2584-1017

Green Resilience: A Community-Based Climate-Smart Vegetable Production Project for Flood-Prone Agricultural Areas in Negros Oriental

Alan E. Faburada*
College of Agriculture, Forestry, and Fisheries, Negros Oriental State University, Pamplona Extension and Guihulngan Campus, Philippines

Abstract—Background: This paper presents the outcomes of the Green Resilience: Climate-Smart Vegetable Production program implemented by the College of Agriculture, Forestry, and Fisheries of Negros Oriental State University in collaboration with local farming communities in low-lying, flood-prone areas of Negros Oriental. Objective: The project aimed to rehabilitate waterlogged farmlands, enhance agricultural resilience, and strengthen community participation through the adoption of climate-smart technologies. Methods: The project ran from October 2024 to April 2025. Guided by a participatory action research approach, farmers most of whom were women successfully adopted raised-bed farming, drainage systems, plastic mulching, and organic nutrient management. Results: The study reported substantial increases in crop yield and household income, alongside strengthened community collaboration. Evaluation findings showed excellent ratings across all indicators and full satisfaction among participants. Conclusion: Overall, the project demonstrates that localized, inclusive, and research-driven climate-smart interventions can transform vulnerable farmlands into sustainable, productive systems and serve as replicable models for gender-responsive and climate-resilient agricultural development.

***Index Terms*—climate-smart agriculture, community-based extension, flood-prone agricultural areas, rural resilience, vegetable production.**

1. Introduction

Climate change continues to pose serious threats to agricultural productivity, particularly among smallholder farmers in rural communities where extreme weather events and degraded soils limit sustainable crop production. In the Philippines and other developing regions, increasing rainfall variability and flooding have intensified soil degradation and crop failures [1]. To address these challenges, climate-smart agriculture (CSA) has emerged as a strategic framework that enhances productivity, strengthens resilience, and mitigates greenhouse gas emissions [2]. Practices such as raised-bed systems, mulching, crop diversification, and organic soil management have been shown to improve soil health, water-use efficiency, and overall yield performance [3], [4].

In Negros Oriental, many rural farmers cultivate vegetables in low-lying, flood-prone areas where persistent waterlogging restricts productivity. These conditions mirror challenges experienced globally in similar agroecosystems, where poor drainage and erratic rainfall threaten food security. Recent studies demonstrate that CSA technologies including plastic mulching, organic amendments, and efficient water management can enhance soil fertility and productivity even under stress conditions [5]. Despite these benefits, local adoption often remains limited due to technical gaps, resource constraints, and the lack of localized demonstration models that respond to community-specific needs.

Emerging evidence suggests that inclusive agricultural programs that engage both men and women farmers contribute significantly to household resilience and sustainable productivity. Studies indicate that community-based CSA initiatives that provide participatory learning opportunities foster broader adoption and improved outcomes in rural areas [6], [7]. These findings affirm the importance of empowering farming households through practical, evidence-based interventions that integrate climate adaptation and social inclusion.

In response, the College of Agriculture, Forestry, and Fisheries (CAFF) of Negros Oriental State University (NORSU) implemented the Green Resilience extension project, which introduced climate-smart vegetable production technologies to rehabilitate flood-prone farmlands. The initiative aligns with several United Nations Sustainable Development Goals (SDGs)—notably SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 5 (Gender Equality), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action)—by promoting livelihood improvement, food security, and sustainable natural resource management.

This paper presents the project's implementation and outcomes, emphasizing its strategies, technologies, and community impacts. Through participatory learning and institutional collaboration, Green Resilience demonstrates how localized CSA interventions can effectively promote climate adaptation, sustainability, and inclusive rural development.

2. Methodology

This initiative employed a participatory action research (PAR) design, which emphasized collaboration between the

*Corresponding author: afaburada77@yahoo.com

faculty and agricultural technicians of the College of Agriculture, Forestry, and Fisheries (CAFF), students from the Bachelor of Science in Agriculture program, and local farmer-participants from a rural community in Negros Oriental. The project was implemented from October 2024 to April 2025 and followed four interrelated phases: site assessment and planning, climate-smart technology implementation, capacity building, and monitoring and evaluation.

The first phase involved a comprehensive site assessment and planning process through a series of consultative meetings with key stakeholders, including representatives from the Provincial Agriculture Office (PAO) and the Local Government Unit (LGU). These consultations helped identify the root causes of poor farm productivity particularly waterlogging and soil degradation and guided the design of context-specific interventions that would improve farm resilience and productivity. The planning stage also established shared responsibilities among partners to ensure participatory ownership and sustainability.

The second phase centered on the implementation of climate-smart agricultural technologies. This included the rehabilitation of the flood-prone communal farm through the construction of raised beds and drainage canals to improve water management. Plastic mulching was applied to suppress weed growth, conserve soil moisture, and minimize pest infestation. Drought- and pest-tolerant vegetable varieties were introduced to enhance crop adaptability, while organic nutrient management using compost and cow manure was adopted to improve soil structure and reduce dependence on synthetic fertilizers.

The third phase focused on capacity building, where farmers underwent hands-on training and demonstrations on sustainable farming techniques such as proper transplanting, staking, and trellising. Additional sessions on integrated pest management (IPM) introduced the use of eco-friendly pest control methods, including a tuba-molasses mixture and intercropping with pest-repellent plants such as Katuray and lemongrass. Post-harvest handling and value-adding practices were also discussed to reduce losses and increase income opportunities.

3. Results

The paper highlights the achievement of the full adoption of all introduced climate-smart agricultural (CSA) technologies among the participating farmers, demonstrating strong receptiveness and engagement throughout the implementation period.

Tables 1–5 summarize the composition of the project participants and farmers' association members. Tables 6 and 7 present recorded yield and gross income for the historical and intervention cropping cycles.

Table 1
Farmer beneficiaries by sex

Male	Female
10	25

Table 2
Faculty and staff participants by sex

Male	Female
4	4

Table 3
Student participants by sex

Male	Female
30	56

Table 4
Age distribution of Sr. San Roque farmers association members

Age (years)	Members	Percentage (%)
20–30	10	28.6
31–40	5	14.3
41–50	10	28.6
51–60	8	22.9
61–70	2	5.7
71–80	2	5.7
Total	**35**	**100.0**

Interpretation:

The majority (57.2%) of the members fall within the 20–50 years old range, indicating a relatively young and active farming group.

The presence of older members (61–80 years old) reflects experienced farmers who serve as mentors to younger members.

Table 5
Local government unit participants by sex

Male	Female
5	4

Table 7
Communal farm yield and gross income per cropping cycle during the extension intervention on a one square meter basis

Crop	Cropping period	Yield (kg)	Gross income (₱)
Eggplant	1st cropping	1,356	67,800.00
Eggplant (ratoon)	2nd cropping	576	37,800.00
Total / average	**—**	**1,932**	**105,600.00**

Notes:

The table reflects the enhanced productivity and profitability of the communal farm under the Climate-Smart Extension Intervention.

The ratooning practice of eggplant contributed an additional yield of 576 kg without full land re-preparation, demonstrating cost efficiency and sustainability.

The income was calculated based on prevailing farm-gate prices during each cropping cycle.

Table 6
Communal farm yield and gross income per cropping cycle in 2023 on a one square meter basis

Crop	Cropping period	Yield (kg)	Gross income (₱)
String beans, cucumber, squash	1st quarter of 2023	258	9,030.00
Sweet corn, cucumber, tomato	3rd quarter of 2023	331	13,902.00
Total / average	**—**	**589**	**22,932.00**

The use of raised-bed systems significantly improved drainage and root aeration, resulting in a 60–70% reduction in crop loss and overall improvement in plant vigor. Plastic mulching further enhanced productivity by suppressing weeds, conserving soil moisture, and minimizing pest infestations, findings consistent with previous studies highlighting mulching's contribution to improved yield and water-use efficiency [3].

4. Discussion

The application of organic nutrient management practices using compost and cow manure effectively enhanced soil fertility and reduced dependency on synthetic fertilizers by approximately 75%, aligning with global sustainability goals for eco-friendly and low-carbon agriculture [1], (Bairagi et al., 2023). Additionally, the introduction of pest-tolerant vegetable varieties and natural pest deterrents such as tuba-molasses solution, Katuray, and lemongrass intercropping contributed to the absence of major pest or disease outbreaks, indicating a healthy and balanced agroecosystem.

Beyond agronomic gains, the project generated meaningful social and community outcomes. A total of 35 farmer-beneficiaries directly participated, 85% of whom were women, showcasing significant female leadership and empowerment in agricultural activities. The project also encouraged youth participation, with 10 members aged 20–30 actively engaging in farm management, ensuring generational continuity in agricultural practice. The initiative led to increased household income, enhanced technical competence, and renewed motivation among participants to pursue sustainable farming as a livelihood.

An evaluation of the extension program revealed exceptional feedback, achieving a 100% satisfaction rate among participants. Respondents gave an excellent rating (5/5) across all major areas of evaluation—objectives attainment, content relevance, resource person performance, logistics, and overall training quality—indicating that the intervention effectively met both learning and livelihood goals. These findings affirm the effectiveness of participatory and community-based approaches in promoting climate-smart agricultural practices and ensuring that beneficiaries feel supported and equipped to apply new knowledge.

Institutionally, the program strengthened partnerships between NORSU-CAFF, the Provincial Agriculture Office (PAO), and the Local Government Unit. This multi-sector collaboration ensured resource sharing, technical support, and sustainability of the intervention beyond its implementation phase. The project also established a model demonstration site for climate-resilient vegetable farming, serving as a learning hub for other nearby communities facing similar challenges.

Collectively, these results underscore the potential of climate-smart vegetable production to build resilience in vulnerable, flood-prone farming areas. The integration of localized CSA technologies, community participation, and institutional cooperation proved instrumental in achieving sustainable outcomes. These results are consistent with global findings suggesting that farmer-led, research-supported, and institutionally anchored interventions can strengthen adaptive capacity, improve livelihoods, and contribute to sustainable food systems (Harrison et al., 2022), [2].

5. Conclusion

The initiative documented in this paper demonstrates that localized, research-based, and participatory interventions can successfully rehabilitate waterlogged farmlands and transform them into productive, sustainable systems. By integrating raised-bed farming, drainage management, plastic mulching, organic nutrient enhancement, and natural pest control, the project improved soil fertility, reduced crop losses, and increased vegetable yield and quality, effectively enhancing agricultural resilience. Full adoption of the introduced technologies and outstanding evaluation results underscore the project's success in meeting its objectives.

Beyond agronomic gains, the program strengthened community participation and inclusivity, empowering women and engaging youth in productive agricultural activities. Strategic partnerships with NORSU-CAFF, the Provincial Agriculture Office, and the Local Government Unit ensured continuous technical support and resource sharing, reinforcing long-term sustainability. The established demonstration site now serves as a replicable model for climate-resilient, gender-responsive, and community-driven vegetable production.

Overall, the project advances Sustainable Development Goals by promoting sustainable, inclusive, and climate-smart agricultural practices that improve livelihoods, food security, and community resilience in flood-prone areas.

6. Recommendations

While the project achieved commendable results, several areas for improvement were identified to sustain and expand its impact. The following recommendations are proposed:

- Scale up climate-smart practices. Expand training sessions and establish additional demonstration sites to reach more farmers and nearby barangays.
- Strengthen market access. Enhance the economic viability of the initiative by linking farmers to local buyers, institutional markets, and cooperatives.
- Upgrade farm equipment and post-harvest facilities. Acquire small-scale machinery such as tillers and dryers to improve production efficiency and minimize post-harvest losses.
- Sustain youth engagement. Develop agri-entrepreneurship programs and incentive schemes to attract and retain young people in agriculture.
- Improve documentation and monitoring. Institutionalize structured record-keeping and data management systems to support evidence-based decision-making and continuous project evaluation.

These recommendations aim to ensure the long-term sustainability, inclusivity, and scalability of the program's outcomes.

References

[1] Food and Agriculture Organization, *Climate-Smart Agriculture Sourcebook*, 2nd ed. Rome, Italy: FAO, 2021.

[2] R. Lal, "Integrating soil health and climate-smart agriculture," *J. Soil Water Conserv.*, vol. 75, no. 5, pp. 123A–129A, Sep./Oct. 2020.

[3] C. Zhao, B. Liu, S. Piao, X. Wang, and J. Zhu, "Effects of plastic mulch on crop yield, water use efficiency, and soil properties: A meta-analysis," *Agric. Water Manage.*, vol. 256, Art. no. 107058, Oct. 2021.

[4] E. Mak-Mensah, P. Obour, E. Essel, Q. Wang, and K. Ahiakpa, "Influence of plastic film mulch with biochar application on crop yield, evapotranspiration, and water use efficiency in northern China: A meta-analysis," *PeerJ*, vol. 9, Art. no. e10967, Mar. 2021.

[5] A. Sokombela, A. R. Ndhlala, M. P. Bopape-Mabapa, B. K. Eiasu, S. Mpai, and P. Nyambo, "Colored plastic mulch impacts on soil properties, weed density and vegetable crop productivity: A meta-analysis," *Sci. Rep.*, vol. 15, Art. no. 31891, 2025.

[6] Food and Agriculture Organization, Pathways to Women's Empowerment in the Promotion of Climate-Smart Agriculture in the Philippines, Myanmar, and Cambodia. Bangkok, Thailand: FAO, 2024.

[7] A. Saran, M. Islam, and S. Minocha, "Interventions promoting resilience through climate-smart agricultural practices for women farmers: A systematic review," *Campbell Syst. Rev.*, vol. 20, no. 2, Art. no. e1289, Jun. 2024.

[8] A. A. G. Al-Shammary, S. S. M. Al-Sammarraee, and Z. M. Yaseen, "A comprehensive review of agronomic practices and their effects on soil health, productivity, and sustainability," *J. Environ. Manage.*, vol. 364, Art. no. 120531, Jul. 2024.

[9] A. K. Daudu, N. J. Nweze, and A. I. Adeoti, "Gender differentials and distributional effects of climate-smart agriculture," *SN Soc. Sci.*, vol. 5, no. 1, Art. no. 83, Jan. 2025.

[10] S. Kumar, D. Pandey, and A. Kumar, "Organic farming for a sustainable future: Soil and yield outcomes under organic nutrient management," *Front. Sustain. Food Syst.*, vol. 9, Art. no. 1564945, 2025.

[11] E. Nchanji, E. W. Chirwa, and N. N. Mudege, "Gender norms and differences in access and use of climate-smart agriculture practices," *Front. Sustain. Food Syst.*, vol. 7, Art. no. 1040977, 2023.

[12] P. Shahbaz, S. ul Haq, A. Abbas, Z. Batool, B. A. Alotaibi, and R. K. Nayak, "Adoption of climate-smart agricultural practices through women involvement in decision-making: Exploring the role of empowerment and innovativeness," *Agriculture*, vol. 12, no. 8, Art. no. 1161, Aug. 2022.

[13] Q. Chen, N. Hu, Q. Zhang, H. Sun, and L. Zhu, "Effects of biodegradable plastic film mulching on the global warming potential, carbon footprint, and economic benefits of garlic production," *Agronomy*, vol. 14, no. 3, Art. no. 504, Mar. 2024.

[14] M. Liu, X. Zhao, M. E. Hossain, S. Wang, W. Dong, S. Gopalakrishnan, and E. Liu, "Effects of plastic film mulching on soil enzyme activities and stoichiometry in dryland agroecosystems," *Plants*, vol. 11, no. 13, Art. no. 1748, Jul. 2022.

[15] A. Olufunke and T. Adeola, "State of climate-smart agriculture (CSA) practices in the North Central and Northwest zones of Nigeria: Demographics, adoption rates, and barriers," *CABI Agric. Biosci.*, vol. 4, no. 1, Art. no. 56, 2023.

[16] W. Zhang, J. Ma, Z. Cui, L. Xu, Q. Liu, J. Li, S. Wang, and X. Zeng, "Effects of biodegradable plastic mulch film on cabbage agronomic and nutritional quality traits, soil physicochemical properties and microbial communities," *Agronomy*, vol. 13, no. 5, Art. no. 1220, May 2023.