

Green Technology for Sustainable Agriculture: A Case Study

Janelyn B. Tumiguing¹, Joefil C. Jocson²

¹Student, Graduate School, Nueva Ecija University of Science and Technology, Nueva Ecija, Philippines.

²Adviser, Graduate School, Nueva Ecija University of Science and Technology, Nueva Ecija, Philippines.

Corresponding Author: tumiguinjanelyn@gmail.com

Abstract: The use of green technology attempts to lessen the harm that humans cause to the environment. When properly applied, they will sustain the Earth's human population and pass on effective agricultural techniques. Green technology is crucial in the development of the Philippines' sustainable agriculture, healthy soils, livestock, and climate-resilient plants. Choosing green technologies can be difficult as many factors are present and interact. Decisions are still frequently made based on one factor, such as cost or energy efficiency. According to gathered review of related studies, the case study concluded that government should adopt ecological civilization as the fundamental plan for the future growth of the country. The main goal of ecological civilization is to protect the environment by using fewer resources more wisely. By pursuing green development, prosperity for the environment can be achieved, and people can profit from it collectively.

Key Words: — *Green Technology, Sustainable Agriculture, environment, resources.*

I. INTRODUCTION

The main sources of income for rural households in the Philippines are farming and fishing. The nation's farming systems are intricate, multifaceted, and designed to encourage effective output and a reliable source of income. However, these have also had unintended environmental effects, such as soil erosion, water pollution, groundwater depletion, the loss of natural ecosystems, and the extinction of species. Exogenous environmental conditions have an impact on farming systems, which in turn have an impact on the resource bases used in agricultural production. Many nations are still at risk as a result of the rising costs of energy, oil, fertilizer, wheat, and wheat-related products, as well as export restrictions imposed by other nations to "protect their own people". This is particularly true for the Philippines, which depends on these major exporters to make up the difference in domestic production (Briones, N. D., 1970).

Being an agricultural nation, the Philippines must make investments in encouraging equitable growth and creating more sustainable agricultural and food systems that can withstand disasters and effectively address the effects of climate change. The primary objective is to grow the agricultural sector in order to achieve food self-sufficiency, improve the rural community, and enhance farmer income. The Philippines should focus on achieving the targets to end/minimize hunger, ensure food security, enhance nutrition, and promote sustainable agriculture among the 17 areas of focus of the Global Sustainable Development Goals (Sanchez, F. C., 2015).

A broad term used to describe the application of science and technology to the development of environmentally friendly goods and services "green technology". Green technology is associated with cleantech, which is more specifically used to describe goods or services that increase operational effectiveness while lowering prices, energy use, waste, or adverse environmental effects (Kenton, W., 2022).

The use of green technology attempts to lessen the harm that humans cause to the environment. When properly applied, they will sustain the Earth's human population and pass on effective agricultural techniques to upcoming generations. Because they lessen environmental harm, produce fewer fossil fuel byproducts, and support the development of sustainable agriculture, green technology is essential for the agricultural industry. These are the main justifications for referring to them

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as clean technology (Das, S., 2021). Hence, this case study offers agricultural ideas to address the effects of population expansion and climate change on food security. Green technology is crucial in the development of the Philippines' sustainable agriculture, healthy soils, livestock, and climate-resilient plants.

II. CASE EVALUATION

Although green technology is still in its infancy, much significant advancement has already been made in fields like waste management, water purification, and renewable energy, as well as in common consumer goods like electronics and vehicles. It could be as simple as a handheld device or as complex as a brand-new technique for removing greenhouse gases from the environment. When many factors are present and interact, choosing green technologies can be difficult. Decisions are still frequently made based on just one factor, such cost or energy efficiency. Social variables, such occupant happiness, should be taken into account as part of the sustainability strategy when creating technology (Si, J., et al, 2016).

It is crucial to identify agricultural technologies that are suitable for the most vulnerable and underprivileged segments of the population as well as sustainable. Along with technical sustainability, which takes into account key aspects of the invention itself, green technology should also take social sustainability, economic viability, and environmental resilience into account.

III. REVIEW OF RELATED LITERATURE

As a recommended course of action, sustainable agriculture aims to maximize economic gains while preserving environmental quality. This strategy is said to require a lot of human resources and promote fresh scientific discoveries. Economic incentives must be created for the development and use of precise technologies (with few residuals that harm the environment) in order to achieve sustainability. Taxation and tradable permits are appropriate strategies to achieve first-best solutions; nevertheless, other institutions must be devised when heterogeneity and lack of knowledge issues are considerable (Zilberman, D., 1997). (Hrubovcak, J., 1999).

People can now accomplish things more intelligently and efficiently than they ever could without the use of technology. Green technology is utilized with the knowledge of how to preserve the environment and natural resources while minimizing human participation. It is a solution to increase the

national economy without affecting the environment (Hrubovcak, J., 1999).

Businesses should embrace green innovation by taking advice from their supply chain partners in light of it is still unknown whether and under what circumstances it influences green invention. Particularly, green technology turbulence decreases the influence of green supplier learning on green process innovation while strengthening the benefits of green customer learning on green product and process innovation. Green technological upheaval has a negligible moderating effect on the relationship between green supplier innovation and green product development (Lisi, W., 2019).

Further evaluation of studies of these green or sustainable technologies has been studied in contribution to directing agriculture in a more sustainable direction. Further productivity gains must be driven by technologies that are both economical and more ecologically friendly if U.S. agriculture is to remain on a sustainable path of economic expansion. Green technology development, however, may be constrained by a lack of markets for the environmental benefits they offer. Furthermore, just having a technology available does not guarantee its adoption. Experience with green technologies like precision agriculture, better nutrient management, integrated pest management, and conservation tillage shows that even when technologies are lucrative, adoption hurdles can restrict their efficacy (Wreglesworth, R. 2021).

According to Adnan et al in 2019 in his study titled, "state-of-the-art review on facilitating sustainable agriculture through green fertilizer technology adoption: Assessing farmer's behavior" suggested that the use of green technology can help address the growing environmental problem. The necessity for contemporary development of environmentally friendly technology and an improvement in production levels across all agricultural crops are implications of green fertilizer technology (GFT). It is especially necessary for paddy production because paddy is the main staple meal for the country and has traditionally been regarded as an important commodity. Under the intertwined criteria of enhancing food security and sustainability, green technology has been encouraged to increase the on-farm resource utilization efficiency. Many nations around the world have thought about funding these sustainable technologies (Adnan, N., 2019).

Renewable energy, zero tillage, biotechnology, organic farming, vertical farming, irrigation, integrated pest control, drones, fleet management, and digital sensors are the top green technologies and practices making farming more environmentally sustainable. Because they lessen environmental harm, generate fewer fossil fuel byproducts, and

promote sustainable agricultural development, green technologies in agriculture are crucial.

IV. PROPOSED SOLUTION

Government should adopt ecological civilization as the fundamental plan for the future growth of the country. In the new era of civilized growth with a healthy ecosystem, the ideals of green development for a sustainable agriculture and people-centered development should serve as the guiding principles. (2) The main goal of ecological civilization is to protect the environment by using fewer resources more wisely and by using ecological capital to perform services. The broad and unsustainable growth mode should be replaced with an environmentally friendly development path with lower emissions of carbon and other pollutants. By pursuing green development, prosperity for the environment can be achieved, and people can profit from it collectively, leading to the peaceful coexistence of humans and nature.

Developing technologies that would protect the environment without losing economic growth is the key issue of the day. The majority of people in developing nations reside in rural areas, where environmental degradation is more widespread due to rapid deforestation, deterioration of watersheds, loss of biological variety, scarcity of fuel wood and water, water contamination, soil erosion, and land degradation. The mission of reforestation, sustainable agriculture, and recycling has been successful in creating a green homeland in many nations across the world, as seen by the financial and technological support provided to the local community. In order to assist the development of rural areas, the right resource allocation in development plans and annual budgets should aid. Farmers can support organic farming by using fewer chemical fertilizers and pesticides.

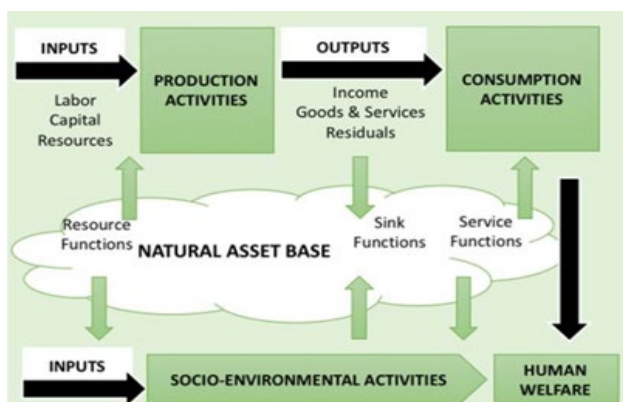


Fig.1. Natural Asset Functions in Cooperative Activities (Quilloy, K. P., &Sumale, Z., 2020)

Cooperatives and sustainability are inextricably intertwined. Cooperatives contribute to both green growth and sustainability based on the three tenets of sustainable development: economic expansion, racial and ethnic diversity, and environmental preservation. According to several experts in the field, farmers will also need increased access to funding in order to successfully make the switch to more sustainable techniques. Government assistance for farmer cooperatives should increase, especially in the area of lending (Quilloy, K. P., &Sumale, Z., 2020).

V. CONCLUSION

Green technology can range in complexity from a simple handheld gadget to a method for eliminating greenhouse gases from the atmosphere. Even today, choices are frequently made based on just one aspect, such cost or energy efficiency. When developing technology, social factors like occupant happiness should be taken into consideration. Finding agricultural methods that are both sustainable and environmentally benign and suited for the most disadvantaged and vulnerable populations are essential. Social sustainability, economic viability, and environmental resilience should all be taken into account when developing green technology. Government should adopt ecological civilization as the cornerstone strategy for the nation's future development. By using fewer resources more intelligently, ecological civilization aims to maintain the environment. Ecological prosperity can be attained through the pursuit of green development, and people can all benefit from it.

Based on the three principles of sustainable development—economic growth, racial and ethnic diversity, and environmental preservation—cooperatives help promote both green growth and sustainability. Many industry experts agree that for farmers to successfully transition to more sustainable practices, they will need more access to capital.

5.1 Implications

Governmental organizations and the corporate sector must collaborate with farmers to increase their understanding of sustainable farming methods in order to promote new smart farm initiatives and aid in reducing the effects of climate change. The Social Institute for Poverty Alleviation and Governance should collaborate with the Department of Agriculture's Agricultural Training Institute to offer courses that educate farmers on climate-smart practices, including the use of contemporary technology and crop and soil management (Philippine Agriculture, 2019).

Such educational initiatives are essential for increasing public knowledge of the potential advantages of technology in agriculture. Agriculture technology is available in the nation, but farmers need to be properly informed about its advantages and how to use it. Even though they would greatly boost harvest efficiency, machines are typically thought to be too expensive for farmers to purchase. To successfully transition to more sustainable practices, farmers will also require improved access to capital. The amount of government support for farmer cooperatives should rise.

The expected adoption of new farming techniques, which may include the use of machinery to reduce the manual labour, should increase demand for farm equipment and support services in rural regions. Additionally, increased use of irrigation, greenhouses, and a potential shift toward organic agriculture may increase demand for related materials, technological supplies, fertilizer, and seeds.

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