



(RESEARCH ARTICLE)



The impacts of agricultural innovation on the livelihood of local rice farmers in selected barangays in Calapan City, Oriental Mindoro

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Abstract

The livelihood of local rice farmers is associated with the success of agricultural innovation technologies implemented by the farmers. Agricultural technology greatly improves farming methods, makes farming more efficient, and grows more food, enabling food security. This research investigates the impact of agricultural innovation on the livelihood of local rice farmers in several barangays within Calapan City. The study used a correlational quantitative research design. Data were collected through survey instruments. This research focused on a sample size of 244 respondents from the selected local farmers located in Barangays Pachoca, Tawiran, Masipit, Canubing II, Puting Tubig, Biga, and Bucayao. By examining the indicators of agricultural innovation and its impact on the livelihood of local farmers, the researchers found that agricultural innovation has a profound positive impact on the various facets of farmers livelihoods. Agricultural innovation is significant and necessary in strengthening the livelihood of local farmers in Calapan City. Thus, this study suggested that the local farmers should be open-minded and continuously utilize innovative agrochemicals and farming technology that enhance sustainable livelihoods for the next generation.

Keywords: Agricultural Innovation; Livelihood; Local Rice Farmers; Philippines

1. Introduction

Agriculture has long been the backbone of many rural communities, providing nourishment, income, and a way of life for countless individuals worldwide. In the Philippines, where rice is a primary crop and a symbol of cultural significance, the livelihood of local rice farmers is intimately connected to the success of their agricultural endeavors. The Philippine agricultural sector is inherently linked to poverty. Nevertheless, it remains vital to achieving inclusive growth as it employs about 30 percent of the country's workforce [1]. This study, entitled "The Impacts of Agricultural Innovation on the Livelihood of Local Rice Farmers in Selected Barangays in Calapan City, Oriental Mindoro," aims to explore the impacts of agricultural innovation on the lives of local rice farmers.

Since time immemorial, farming has been done using traditional methods until the introduction of technology in agriculture [2]. Not everyone can readily keep up with the most recent innovations, methods, and technologies utilized in farming, given their conventional practices and habits. However, due to agricultural innovation, adoption and technology advanced with each succeeding generation. Farmers in various regions of the Philippines have the chance and encouragement to modify it for rapid advancement and farming practices. An agricultural innovation is defined as a new technology or practice that is used in agribusiness to improve operations. It typically results in higher yields, better quality products, lower costs, and increased sustainability. Agricultural innovation refers to the development and application of new ideas, techniques, technologies, and practices in the field of agriculture to improve productivity,

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sustainability, and efficiency. Farmers greatly benefit from adopting agricultural innovation, especially because this is their primary source of income [3].

The problem that local rice farmers in Calapan City, Oriental Mindoro, may experience is the lack of access to modern farming technologies and practices. This can hinder their ability to improve productivity, reduce costs, and adapt to changing environmental conditions. Without access to advanced machinery, efficient irrigation systems, or knowledge about modern farming techniques, farmers may struggle to maximize their yields and compete in the market. This can have a negative impact on their livelihoods, as they may face lower incomes and reduced profitability. Additionally, the lack of access to agricultural innovation may limit their ability to adopt sustainable farming practices, leading to potential environmental degradation and long-term sustainability challenges. For the local rice farmers in Calapan City, Oriental Mindoro, using agricultural innovation can be a helpful way.

By focusing on the adoption and application of agricultural innovation, this research seeks to understand its multifaceted impacts on local rice farmers' well-being and prosperity in the selected barangays of Calapan City. It will explore not only the technological advancements and their implementation but also the challenges faced by farmers in embracing and adapting to these innovations. Moreover, this study aims to investigate the impacts of agricultural innovation on the economic well-being of rice farmers in selected barangays in Calapan City, Oriental Mindoro. The primary objective is to assess how the adoption of innovative agricultural practices and technologies influences the livelihoods of local rice farmers. The scope of the study is limited only to the area of Calapan City, Oriental Mindoro.

Furthermore, the research may face limitations such as data availability, the potential influence of external factors, and the inherent challenges in assessing the long-term impacts of agricultural innovation on livelihoods. The identified research gap is the need for a comprehensive understanding of the specific impacts of agricultural innovation on the livelihoods of rice farmers in this particular locality. The identified research gap is the need for a comprehensive understanding of the specific impacts of agricultural innovation on the livelihoods of rice farmers in this particular locality.

2. Review of Related Literature

2.1. Agricultural Innovation

Agricultural productivity and improved livelihood remained low as a result not only of the lack of appropriate technologies and the lack of access to those technologies, inputs, credit, and access to markets and rural infrastructure, but also because of gaps in information and skills that prevented rural producers from effectively utilizing and adopting technologies [4].

Agricultural productivity growth may be achieved through farmers' adoption of improved agricultural technological innovation (e.g., high-yield variety crops, genetically modified crops), along with the provision of good extension services that facilitate access to credit and insurance markets and irrigation facilities [5]. Adoption of improved inputs like improved seeds, herbicides, pesticides, and fertilizers increased productivity as well as the income of adopters. All these may lead not only to yield, income, labor-saving, efficiency, and productivity improvements but also to environmental factors behind low and stagnant agricultural productivity. Non-adopting and low adoption rates of improved agricultural technologies must be identified to reduce poverty and improve the welfare of society and the growth of the economy. [6].

2.2. Livelihood

Community farming is the main source of livelihood for Filipinos. Farms make up one-half of our total land area. Farmlands in the Philippines include fruit and vegetable farms where crops such as rice, corn, tobacco, coconut, and abaca are produced. [7]. Agriculture is the cornerstone of human survival. Farmers use skills and knowledge of natural resources to grow food and support their livelihoods [8]. Farmers and fishermen were the two poorest groups of workers in the Philippines in 2021, with nearly one in three living below the poverty threshold, compared to the national average of around one in five, according to a survey by the Philippines Statistics Authority released this year. Input costs for farmers have more than doubled since 2020, adding to their burden [9].

Local farmers are being forced to "compete with more advanced or heavily subsidized agricultural production from abroad." Between 2019 and 2022, the government spent more than 155 billion pesos (\$2.8 billion) to import 14.1 million metric tons of rice because it does not produce enough rice to feed its population, causing losses of nearly 300

billion pesos (\$5.5 billion) to local farmers who have had to reduce prices to compete with cheaper imports, said Danilo Ramos, leader of the Peasant Movement of the Philippines [10].

The farmers' livelihood is composed of all the elements that constitute or affect the farmers' livelihood background, livelihood process, and livelihood means and includes the farmers' livelihood capital, which includes the farmers' natural, physical, human, social, and financial resources [11]. According to Agri-Info hub, Oriental Mindoro is endowed with an abundant and rich agricultural base. It is dubbed the Rice Granary of the MIMAROPA, accounting for 35% of the rice production in the region and ranking 14th in the country [12]. In 2019, the province produced 339,338.71 metric tons (MT) of high-value commercial crops and 420,002 MT of rice. It shows that agriculture remains the backbone of the province's economy. The selection of farmers' livelihood strategies can not only advance the understanding of contemporary rice-growing practices but also significantly improve the prediction of development trends in rice farming [13].

Farmers involved in non-farm livelihood activities are more efficient in fulfilling their families' basic needs, are more able to endure shocks, and have a more sustainable livelihood than those who rely on farming only for their living. Agricultural innovation can have both direct and indirect effects on the livelihood and productivity of the beneficiaries. [14]. Agricultural innovation contributes to poverty reduction, improving livelihoods, and enhancing productivity outcomes.

3. Theoretical Framework

3.1. A Model for Innovation-Decision Process

Rogers conceptualized the innovation-decision process with five stages speculated in the adoption process. These stages are "knowledge, persuasion, decision, implementation, and confirmation." He explained that knowledge is acquired when a person is made aware of the presence of an innovation and its characteristics, as well as how it works. The individual reaches the persuasion stage upon the development of an attitude appropriate to the technology. This attitude can be either a positive or a negative one. The decision stage is reached when the individual profoundly conducts certain activities, which will lead to either accepting or rejecting the innovation. The individual reaches the implementation stage when the innovation has been put into practice. [15].

3.2. Livelihood

A livelihood consists of the capabilities, assets (including both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or improve its capabilities and assets both now and in the future, while not undermining the natural resource base. A livelihood comprises the capabilities, assets (stores, resources, claims, and access), and activities required for a means of living. A livelihood is sustainable if it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, provide sustainable livelihood opportunities for the next generation, and contribute net benefits to other livelihoods at the local and global levels and in the short and long term [16].

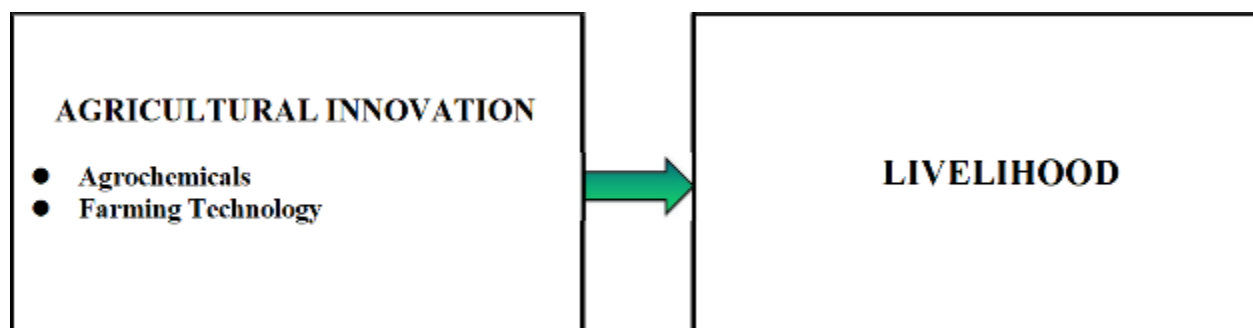


Figure 1 Conceptual Framework

Figure 1 shows the conceptual framework of the study. It presents the relationship between the two variables: agricultural innovation as the independent variable and the livelihood of local rice farmers as the dependent variable. Agricultural innovation is an independent variable that can have both direct and indirect effects on the livelihood and productivity improvement of the beneficiaries. Impact of Agricultural Innovation on Improved Livelihood and Productivity Outcomes Among Smallholder Farmers in Rural Nigeria (2016) says that the factors mentioned in

agricultural innovation are agricultural inputs and adopting technologies. In this study, these two factors will be used as the indicator of Independent Variable, in specific terms as Agrochemicals and Farming Technology.

3.3. Hypothesis of the Study

There is a significant relationship between the Impacts of Agricultural Innovation on the Livelihood of Local Rice Farmers in Selected Barangays in Calapan City, Oriental Mindoro.

3.4. Statement of the Problem

The study aimed to determine the Impacts of Agricultural Innovation on the Livelihood of Local Rice Framers in Selected Barangays in Calapan City, Oriental Mindoro.

It specifically seeks the answers to the following questions:

- What is the impacts of Agricultural Innovation in terms of;
 - Agrochemicals
 - Farming Technology
- Which among the Agricultural Innovations in terms of Agrochemicals and Farming Technology has the most impact on the Livelihood of Local Rice Farmers in Selected Barangays in Calapan City, Oriental Mindoro?
- Is there a significant relationship between Agricultural Innovation on the Livelihood of Local Rice Framers in Selected Barangays on Calapan City, Oriental Mindoro?

4. Methods

This study used a quantitative research design. The goal of quantitative research is to gain a thorough understanding of social phenomena in their natural environment. It emphasizes the "why" rather than the "what" of social phenomena and depends on the first-hand accounts of people as the agents of meaning creation in their daily lives. In order to gather the data for this study, a survey questionnaire was used. Because of this, the study employs a descriptive research methodology. Strives to precisely and methodically characterize a problem or occurrence and, if possible, to come up with potential solutions to current problems from gathered data information. Both primary and secondary sources were used to assemble the information for this study.

The research started with the identification of the total population, which amounted to 631 local rice farmers across seven selected barangays in Calapan City: Pachoca, Tawiran, Masipit, Puting Tubig, Biga, Bucayao, and Canubing. From this, the sampling frame was established, encompassing the specific units under study. Slovin's formula was then employed to calculate the required sample size. Following this calculation, specific numbers of respondents per barangay were determined, Brgy. Pachoca has 20 respondents, Brgy. Tawiran with 23 respondents, Brgy. Masipit with 14 respondents, Brgy. Biga, with 19 respondents, Brgy. Bucayao, with 62 respondents, and Brgy. Canubing II had 81 respondents. Subsequently, a survey questionnaire was administered to the selected sample of participants from these 7 barangays of local rice farmers, ensuring representation across the identified population. The data collection was conducted at the City of Agricultural Services Department (CASD), utilizing simple random sampling to ensure an equal chance of selection for all units, thereby minimizing potential biases in this study.

5 Results and Discussions

The study tested two independent variables and one dependent variable, namely, in agricultural innovation, agrochemicals and farming technology, and in independent variables, livelihood. The researchers used Pearson's r to test the reliability of the questionnaire. Twenty-five respondents answered the questionnaire twice over a week. The results of the reliability test were based on a coefficient per item ranging from 0.7414 to 0.9853, which can be interpreted and declared reliable.

The results of the correlation analysis were obtained in the table below.

The interpretation provided in the table states that both correlations between agrochemicals and farming technology are significant. This suggests that there is a statistically significant relationship between these independent variables and the dependent variable. For agrochemicals, $r = 0.222955$ suggests a weak positive correlation with the DV. This means that as agrochemical usage increases, there's a slight tendency for the DV to increase. $r^2 = 0.049709$ indicates

that about 4.97% of the variation in the DV can be explained by changes in agrochemical usage. For farming technology, $r = 0.849182$ indicates a strong positive correlation with the DV. This suggests that as the level of farming technology increases, the DV also tends to increase significantly. $r^2 = 0.721110$ suggests that approximately 72.11% of the variation in the DV can be explained by changes in farming technology. In summary, the table suggests that farming technology has a much stronger and more significant impact on the livelihood compared to agrochemicals. Both factors are significant for the livelihood of farmers.

Table 1 Reliability and Validity Test

Independent Variable	Pearson's R Result		Dependent Variable	Pearson's R Results	
Agrochemicals	0.222955	Reliable	Livelihood	0.849182	Reliable
Farming Technology	0.849182	Reliable			

Table 2 Result of Correlation Analysis

Independent	Dependent	r	r ²	Sig
Agrochemicals	Livelihood	0.222955	0.049709	0.00
Farming Technology	Livelihood	0.849182	0.721110	0.00

4.1. The Impacts of Agrochemicals on the Livelihood of Local Rice Farmers

The results of every question about agrochemicals have been proven and substantiated by the supportive articles and findings from different studies regarding the impact of agrochemicals on the lives of farmers [17]. It is mentioned that the use of agrochemicals contributes not only to the healthy growth of crops and animals but also to improving farm work efficiency and a stable supply of agricultural produce. The use of agrochemicals contributes not only to the healthy growth of crops and animals but also to improving farm work efficiency and the stable supply of agricultural produce. Improvement of food safety and quality, increase in profit, and even improve human health by eliminating pests and diseases. Agrochemicals are chemical agents used on farmlands to improve the nutrients in the field or crops [18]. The findings from both the survey and the cited studies reveal a consensus among respondents that agrochemicals positively impact agriculture. They're perceived to ensure a stable supply of produce, enhance farm work efficiency, improve food safety, increase profits by addressing pests and diseases, and effectively boost rice yield. The supporting articles reinforce these notions, highlighting agrochemicals' role in promoting healthy crop growth, improving farm efficiency, ensuring food safety, increasing profits, and enhancing human health by eliminating pests and diseases.

4.2. The Impacts of Farming Technology on the Livelihood of Local Rice Framers

The findings across the studies and literature consistently emphasize the positive impact of farming technologies in modern agriculture. Linly Ku and Isabel Serna [19] discuss the crucial role of technology in addressing challenges such as rising costs, labor shortages, and changing consumer preferences for sustainability. They highlight how technology enhances efficiency, productivity, and sustainability in food production. Meanwhile, Fang Wu's [20] study specifically focuses on the adoption of new agricultural technologies by family farms in China, emphasizing their importance in advancing agricultural science and production efficiency.

4.3. Livelihood

The research findings indicate a significant positive impact of agricultural innovation on local rice farmers' livelihoods, including improvements in asset and working capital, social adoption, knowledge, skills, and overall satisfaction. This aligns with prior studies supporting the idea that agricultural innovation plays a crucial role in enhancing farmers' lives and promoting sustainable practices. The Institute of National Resources (2021) emphasizes agriculture's vital role in human survival, while studies like 'Smallholder Rice Farming Practices across Livelihood Strategies' (2022) highlight how understanding farmers' strategies can predict development trends in rice farming. Moreover, Eshetu et al. (2017) suggest that diversifying livelihood activities beyond farming can lead to greater resilience and sustainability for families. Lastly, the Impact of Agricultural Innovation on Improved Livelihood and

Productivity Outcomes Among Smallholder Farmers in Rural Nigeria (2016) underlines how agricultural innovation directly and indirectly influences livelihood and productivity, offering a hopeful path for poverty reduction and enhancing farmers' outcomes. The findings underscore that agricultural innovation significantly boosts farmers' livelihoods by enhancing their assets, skills, and social adoption. Diversification beyond farming and understanding varied livelihood strategies are crucial for sustainable development in agriculture, indicating a hopeful path for poverty reduction and improved productivity among smallholder farmers.

5. Conclusion

The study has unveiled substantial evidence showcasing the profound positive impact of agricultural innovation on various facets. Through the exploration of agrochemicals and farming technology, it's evident that agricultural innovation significantly enhances agricultural practices, promoting efficiency and sustainability. Moreover, the findings highlight the crucial role agricultural innovation plays in improving livelihoods, particularly among local rice framers in selected barangays of Calapan City, Oriental Mindoro. The demonstrated correlation between agricultural innovation and the livelihood of local rice farmers emphasizes the significance and necessity of innovation in bolstering agricultural productivity and securing sustainable livelihoods within the community.

Recommendations

In accordance with the findings and conclusions of the study, the researchers recommend the following;

Maintaining the positive impact of agricultural innovation by establishing educational programs that focus on modern agricultural techniques, sustainable farming practices, and the use of technology would greatly benefit farmers. This could include workshops, training sessions, and access to information on best practices for crop rotation, soil conservation, and water management. The Department of Agriculture (DA) or local government units (LGUs) can initiate a structured project or program aimed at educating farmers on adapting agricultural innovation.

By improving the use of agrochemicals, farmers could learn about the safe and effective use of agrochemicals such as fertilizers, pesticides, and herbicides. The program could provide guidance on utilizing farming technology, including precision agriculture tools, automated irrigation systems, and smart farming techniques, to optimize crop production while minimizing environmental impact. Additionally, setting up community resource centers equipped with updated farming information, market trends, and technological advancements would empower farmers with ongoing support and knowledge. By establishing these centers, the DA or LGUs can create a space for farmers to share experiences and collectively improve their methods.

The local government and Department of Agriculture should provide modern farming technology like solar dryers, models of rice precision drill direct seeding machines, rice precision seeding equipment for transplanting, and drip irrigation. These technologies can significantly enhance agricultural innovation and improve the livelihood of farmers.

Further studies are recommended to address the other factors affecting agricultural innovation and carry out a similar study in another nearby town.

Compliance with Ethical Standards

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Disclosure of conflict of Interest

The author declares that there is no conflict of interest in the research conducted.

Statement of informed consent

The survey questionnaires for the participants are kept completely private and confidential. The information gathered and examined is equally private and secure as the moral standards that guide research ethics. To protect the consumers' data privacy, all information gathered from the survey is kept completely confidential. In order to avoid any potential misconduct towards their respondents, the researchers conduct their surveys in a strictly professional manner.

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