

POST-HARVEST TECHNOLOGICAL INNOVATION IN SUSTAINABLE AGRIBUSINESS MANAGEMENT

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Abstract

In the face of global challenges such as climate change and population growth, sustainable agricultural practices are becoming increasingly important. Post-harvest technological innovation offers solutions that have the potential to improve efficiency, product quality and reduce crop losses in agribusiness supply chains. This research aims to explore and analyze the role of post-harvest technological innovation in the context of sustainable agribusiness management. This research uses a qualitative approach with descriptive methods. The research results show that sustainable agribusiness management plays an important role in improving agricultural practices towards a more balanced and sustainable system, paying attention to environmental, economic and social aspects in the food supply chain. Post-harvest innovation is key in reducing losses in the supply chain, improving product quality and supporting sustainable food security. Adoption of the latest technology in post-harvest handling helps farmers reduce crop losses, increase productivity and reduce environmental impacts. The impact extends from the economic aspect, where farmers get a more stable income and increase the competitiveness of their products, to the social and development of rural communities. Reducing waste and increasing the added value of products opens up new opportunities for farmers, while improving food safety provides confidence to consumers and supports sustainable development goals in meeting global needs for safe and healthy food.

Keywords: Innovation, technology, Post-Harvest, Agribusiness Management, Sustainable.

A. INTRODUCTION

Periodic special sectoral development in agribusiness is very important in managing natural resources and human resources to increase community income and welfare (Setiyanto, 2013). Focusing on farmers or more broadly is the core of the concept of sustainable development, which is implemented through Sustainable Agribusiness. The expansion of development in the agribusiness sector aims to create new jobs, develop farming, and reduce poverty levels to encourage economic growth in a region (Utama, 2013).

The sustainable development process involves continuous adjustments between natural resources, socio-cultural aspects, and technology. This aims to maintain a dynamic balance towards maintaining resource capacity without harm, so that it can meet the need for goods and services within and between different generations (Setianingtias et al, 2019). Thus, sustainable development in the agribusiness sector not only pursues economic growth, but also maintains

ecological balance and social justice to ensure long-term sustainability for society (Heryadi et al, 2022).

Utilization of marketing opportunities for agribusiness products at the farm worker level is often less than optimized, resulting in negative impacts on their welfare and income levels (Nurif, 2010). Research by Umanailo (2017) highlights the need to increase farmworkers' understanding of and access to markets. By increasing awareness of marketing opportunities, training in marketing skills, and developing cooperative networks among farmers, farmworkers can gain greater economic benefits from their agricultural products. This will also increase the competitiveness of agricultural products in local and international markets, which in turn can increase the income and welfare of farm workers (Purwanti, 2020).

The influence of the capitalist economy in rural agricultural areas is reflected in the use of modern technology and a marketing system that tends to be efficient. Although these technologies and systems can increase productivity and production efficiency, they can also have a negative impact on farm workers (Maulida et al, 2023). Changing agricultural land to non-agricultural land, such as for property or industrial development, results in reduced employment opportunities in the agricultural sector. This creates serious challenges for the welfare and survival of agricultural workers, as well as resulting in economic uncertainty in rural areas (Sari & Handoyo, 2022). Therefore, it is important to consider the social and economic impacts of capitalist economic development in rural areas and take appropriate policy steps to protect the interests of agricultural workers and ensure the sustainability of the agricultural sector (Elizabeth, 2007).

In dealing with the negative impacts of capitalist economic penetration in rural agricultural areas, it is important to design policies that support the interests of agricultural workers. These policy measures should focus on promoting the sustainable development of agricultural communities, taking into account the goals of increasing welfare and more efficient rural agricultural productivity (Rinardi et al, 2019). One promising solution is through the application of post-harvest technological innovation. By utilizing post-harvest technology such as efficient processing, storage and distribution, farm workers can increase the added value of their agricultural products and expand access to wider markets (Sudjatha & Wisaniyasa, 2017). Apart from that, post-harvest technological innovation can also help reduce crop losses, improve product quality, and increase the competitiveness of rural agricultural products in the market (Rachmawati & Gunawan, 2020).

In the agricultural sector, the term "post-harvest" refers to a series of actions or treatments given to agricultural products after harvest until the commodity reaches the consumer (Mutirawati, 2007). Scientifically, this term is more accurately referred to as "post-production", which consists of two main stages: post-harvest and processing (Kembaren & Muchsin, 2021). Post-harvest or postharvest handling is often also referred to as primary processing, and includes all treatments from the time the harvest is carried out until the commodity can be considered "fresh" or ready for further processing. This treatment generally does not change the physical or visual appearance of the commodity, but focuses on preparation for further marketing and distribution (Elizabeth & Anugrah, 2020).

Meanwhile, processing is a series of actions that change agricultural products into other forms or conditions for various purposes, such as extending the shelf life (preservation), preventing unwanted changes, or for other special uses. This includes food processing and industrial processing (Zam et al, 2019). Through secondary processing, agricultural commodities can be converted into various products that are more durable, have higher added value, or suit specific market needs (Hasibuan et al, 2022). By understanding and managing these two stages well, agricultural industry players can increase the added value of their products and meet various market needs (Rahayu & Kartika, 2015).

Post-harvest innovation has a very important role in realizing sustainable agribusiness management. After the harvest process, agricultural products still face a significant risk of loss due to improper storage, careless handling and inefficient processing (Umar, 2011). Innovations in post-harvest technology not only aim to extend the shelf life of agricultural products, but also to reduce losses due to spoilage, improve product quality, and increase added value (Tsurayya & Kartika, 2015). Thus, post-harvest innovation can help farmers and agribusiness actors to increase production efficiency, maximize harvest potential, and optimize overall supply chain management (Furqon, 2014).

Apart from that, post-harvest innovation also plays an important role in supporting sustainability aspects in agribusiness. By using environmentally friendly technology in the storage, handling and processing of agricultural products, we can reduce the carbon footprint and other negative impacts on the environment (Kurniawati et al, 2020). In addition, post-harvest innovation also opens up opportunities to minimize waste of resources, such as energy and water, through the use of more efficient systems (Wuryandari et al, 2020). By implementing sustainable post-harvest practices, we can not only increase productivity and economic profits, but also maintain ecological balance and improve the social welfare of farmers and agribusiness actors as a whole (Rahardjo et al, 2023).

Sustainable agribusiness management practices have become increasingly important throughout the world, considering the challenges faced by the agricultural sector in maintaining a balance between economic growth, environmental sustainability and social justice (Susiana, 2015). With an ever-growing population, increasingly pronounced climate change, and increasing awareness of the importance of protecting the environment, sustainable practices in agribusiness management are crucial in ensuring sustainable food security for future generations (Burhanudin et al, 2020). This involves the implementation of environmentally friendly agricultural practices, the use of innovative technology to increase efficiency and productivity, and the empowerment of farmers and agribusiness actors in adopting practices that are economically, socially and environmentally sustainable (Mahbubi, 2013). Thus, sustainable agribusiness management is not only a local agenda, but also a global priority in efforts to achieve sustainability in the world food system (Waluyo 2024).

The aim of this research is to identify and develop post-harvest technological innovations that can increase efficiency, productivity and sustainability in agribusiness management. By understanding the potential for post-harvest technological innovation, it is hoped that this research

can contribute to reducing post-harvest losses, increasing the added value of agricultural products, and supporting more environmentally friendly agribusiness practices. The benefits of this research include improving farmer welfare, environmental sustainability, and better food security through the implementation of sustainable agribusiness management practices.

B. METHOD

This research uses qualitative research. Qualitative research method according to Creswell (2016), this research method explores and understands the intentions of a number of individuals or groups of people originating from social problems. Qualitative research is often used in research on people's lives, behavior, history and so on. This research aims to describe and describe events and phenomena that occur in the field and present data systematically, factually and accurately for a particular population or region regarding certain traits, characteristics or factors. This research uses a qualitative approach because this research seeks to understand Post-Harvest technological innovation in Sustainable Agribusiness Management. Data analysis in this research begins with collecting raw data that has been obtained during observations, interviews and surveys. Raw data obtained in written form, soft copy, recordings or notes during research, is then collected to be combined into data and information that is simpler to read and understand (Yuliana, 2022). The results of the interview and survey data collection obtained were then compiled based on the data mining guidelines which were used as instruments in the research that had been prepared previously. Then the data was prepared to be read and understood, making it easier for the writer to analyze the description of the data, then the interview results were identified based on questions asked by the researcher to several sources who had been appointed as informants in the research. The results of the grouping carried out will be used as research material to prepare the data to be analyzed.

C. RESULTS AND DISCUSSION

Post-Harvest Technology in Sustainable Agribusiness Management

The term “Sustainable Agribusiness” has taken center stage in the agricultural industry as it highlights the urgency for a paradigm shift in agricultural practices. No longer just a buzzword trend, this concept has become a foundation for agribusiness actors who want to ensure the long-term sustainability of their business (Brenya et al, 2023). Sustainable agribusiness emphasizes the importance of meeting current food needs without compromising the ability of future generations to meet their own needs. This includes implementing sustainable agricultural practices, such as wise use of natural resources, efficient waste management, and integration of environmentally friendly technology (Mariyono, 2020). Through this approach, agribusiness actors hope to create an agricultural system that is not only economically productive, but also environmentally and socially friendly. Thus, sustainable agribusiness is not just about achieving profits in a short time, but also about building a sustainable future for the agricultural industry and society as a whole.

Over the past two decades, there has been significant growth in the movement questioning the role of agricultural companies in adopting practices that contribute to social and environmental

problems. The Sustainable Agribusiness Movement has begun to emerge, emphasizing the need for transformation towards more sustainable practices in the agricultural industry. Currently, this movement is increasingly gaining wider support and acceptance in the agricultural mainstream (Waluyo, 2024). The Sustainable Agribusiness approach not only addresses environmental problems, such as land degradation and water pollution, but also addresses social issues, such as farmer welfare and labor rights. Moreover, Sustainable Agribusiness offers innovative and economic opportunities for all stakeholders in the food system, including farmers, agricultural workers, consumers, policy makers, and others (Savoy et al., 2017). In this way, the Sustainable Agribusiness movement is not only changing the way we think about food production, but also broadening our view of the importance of sustainability in providing food for the world's growing population.

The Sustainable Agribusiness Movement reflects a strong drive to improve the balance between current food needs and nature's ability to provide resources in the future. This involves collaboration between various parties in the food system, from farmers to consumers, to change mindsets and practices that have become the norm in the agricultural industry (Shih et al., 2018). By applying Sustainable Agribusiness principles, such as organic practices, soil conservation, and diversification of farmers' income sources, we can build an agricultural system that is more resilient and responsive to future challenges. Apart from that, this approach also allows for technological innovation and business models that are more inclusive and fair for all parties involved. Thus, the Sustainable Agribusiness movement not only provides solutions to current environmental and social problems, but also opens the way to a more sustainable and fair future for all (Damke et al, 2021).

In sustainable agribusiness management practices, efforts to integrate these three main objectives demonstrate a commitment to creating a balanced and sustainable agricultural system. First, achieving a healthy environment is a top priority, where agricultural practices must pay attention to the balance of the ecosystem and maintain natural sustainability. This involves the use of environmentally friendly farming techniques, preservation of biodiversity, and conservation of natural resources. Apart from that, economic profitability is a crucial aspect in sustainable agribusiness management. Agricultural businesses must generate sufficient profits to maintain their operations, enabling farmers and other agribusiness actors to achieve long-term economic sustainability. However, this profitability should not be achieved at the expense of environmental sustainability or social justice (Allen et al., 1991). Finally, social and economic justice play an important role in sustainable agribusiness management. This includes ensuring that all parties involved in the supply chain, including farmers, agricultural workers and local communities, receive fair and appropriate benefits from agricultural activities. This involves paying fair wages, safe working conditions, and equitable participation in profits and decisions.

The importance of post-harvest innovation in sustainable agribusiness management has been widely recognized for its role in reducing losses in the food supply chain. Effective post-harvest innovation can significantly reduce losses in terms of both quality and quantity of agricultural products, ranging from reductions in quality to total loss of products that are not

marketable or unfit for consumption. By minimizing post-harvest losses, this innovation not only supports environmental sustainability by reducing food waste, but also supports economic sustainability by increasing the income potential of farmers and agribusiness actors. Additionally, by maintaining the quality and freshness of agricultural products, post-harvest innovation also helps maintain market reputation and increase consumer confidence, which in turn strengthens the sustainability of the entire food supply chain.

Procedures or treatments in post-harvest handling in sustainable management can vary depending on the type of agricultural commodity grown and the scale of production. For plantation commodities grown on a large scale, such as coffee, tea or tobacco, post-harvest handling is often referred to as primary processing. The purpose of primary processing is to prepare plant products for further industrial processing. This process can involve several steps such as withering, drying, peeling, washing, fermentation, and so on. For example, in coffee, the coffee fruit will be picked from the tree and then withered to remove the layers of the fruit, after which the coffee beans will undergo a drying process in the sun to reduce the water content. Next, the coffee beans will be sorted, the skin will be peeled, and may also go through a fermentation process before being packaged to be sent to further processing factories.

During this primary processing process, it is important to pay attention to sustainability principles in order to increase efficiency and reduce environmental impacts. For example, efficient energy use, good waste management, and the use of environmentally friendly materials must be considered at every stage of the process. In addition, the need to pay attention to safe working conditions and the welfare of agricultural workers is also an important part of sustainable management. By implementing appropriate procedures and treatment in post-harvest handling of plantation commodities, we can ensure that agricultural production is not only economically sustainable, but also socially and environmentally.

Post-harvest handling of seed production is crucial in ensuring that the seeds produced are of optimal quality and are able to maintain their germination and vigor until planting. This process is not only about creating high-quality products, but also taking into account the environmental and social impacts resulting from these practices. Seed technology involves a series of planned and measurable steps. The initial stage includes selecting high-quality fruit, which is the foundation for the quality of the beans produced. Seed collection is carried out carefully to ensure that the integrity of the seeds is maintained. Next, the cleaning process is carried out to remove dirt and other organic materials that can interfere with the quality of the seeds. Drying is an important step to reduce the water content of seeds, which if too high can result in damage or infection of the seeds. Then, through a sorting process, the beans are sorted based on size, color and possible defects to ensure only quality beans are packaged.

Seed packaging is also an important aspect of seed technology, where the use of environmentally friendly materials and efficient design are of primary concern. Furthermore, seed storage must be carried out in optimal conditions to maintain appropriate humidity, temperature and cleanliness so that seed quality is maintained. Thus, through the application of appropriate seed technology, both in terms of product quality and environmental and social impacts,

sustainable agribusiness management in seed production can be achieved by maintaining a balance between economic, environmental and social needs.

Post-harvest handling of food crop commodities such as cereals, tubers and nuts plays an important role in ensuring sustainable food security. The main aim is to maintain the quality of commodities that have been harvested in good condition and remain suitable for consumption during the storage period which can last for quite a long time. The post-harvest handling process for this commodity involves several carefully regulated steps to minimize damage and loss and maintain the nutritional and organoleptic value of the product.

First of all, after harvest, grains, tubers and nuts must be processed immediately to reduce their water content and avoid the growth of microorganisms that can cause spoilage. Next, the cleaning process is carried out to remove dirt and other plant remains attached to the commodity. After that, the commodity is packaged with appropriate materials to maintain cleanliness and prevent damage during storage. Controlling temperature and humidity is also an important factor in sustainable storage, which aims to slow the rate of degradation and the growth of fungus and pest insects. During the storage period, continuous monitoring is carried out to identify signs of damage or degradation. In addition, the use of controlled cooling or drying technology can help extend the shelf life of commodities without reducing their quality. By optimizing the post-harvest handling process, including implementing environmentally friendly and efficient practices, high quality products can be produced that are still delicious to consume, and contribute to sustainable food security for society.

Lastly, post-harvest handling of horticultural products in sustainable agribusiness management is an important aspect in maintaining the quality and durability of products which are generally fresh and easily damaged. The main goal is to maintain the fresh condition of the product and prevent unwanted changes during the storage period. Horticultural products are susceptible to various physical and chemical changes, such as shoot growth, roots, bent stems, wrinkled fruit, hardened pods, and green tubers. Apart from that, excessive ripening can also reduce product quality. Therefore, post-harvest handling must be carefully designed to minimize damage and slow down the process of undesirable changes.

Steps in post-harvest handling of horticultural products include careful management of temperature and humidity, selecting appropriate storage techniques, and using appropriate packaging methods. Controlling temperature and humidity in storage warehouses is key to slowing the rate of respiration and growth of microorganisms, which contribute to reduced product quality. In addition, the use of controlled atmosphere technology and the use of packaging materials with gas inhibitor properties can help extend the shelf life of products. The packaging process must also pay attention to factors such as air circulation, humidity, and protection from excessive light. Thus, through the implementation of appropriate post-harvest handling practices, horticultural products can remain fresh and of good quality, which ultimately supports the goals of sustainable agribusiness management and meets consumer needs for quality fresh products.

Implications of Post-Harvest Innovation in Sustainable Agribusiness Management.

Innovations in post-harvest handling have several significant implications in the context of sustainable agribusiness management:

1. Increased Efficiency

Increasing efficiency in post-harvest handling, through technological innovation, is a crucial aspect in supporting sustainable agribusiness management. By adopting advanced technology in the handling, processing and storage of agricultural products, operational efficiency can increase significantly. For example, the use of automation machines and equipment can speed up the packaging and storage process, reduce delays in the supply chain, and minimize crop losses due to improper handling. Apart from that, the integration of information and sensory technology in monitoring and controlling the storage environment can also help in optimizing storage conditions and reducing the risk of product damage. With improved efficiency, agribusiness management can reduce operational costs and increase productivity, which in turn contributes to long-term economic sustainability.

Apart from that, increasing efficiency in post-harvest handling can also help reduce waste of natural resources. By minimizing crop losses and optimizing the use of environmentally friendly technology, agribusiness management can achieve greater yields with less input. For example, by reducing crop losses, farmers do not need to plant more crops to get the same yield, which can ultimately reduce pressure on land and other natural resources. The use of efficient and energy-saving technology can also help reduce the carbon footprint and other negative impacts of agricultural processes, in line with environmental sustainability principles.

Efficiency in post-harvest handling also has an impact on social welfare in the context of sustainable agribusiness management. By minimizing crop losses, farmers and other agricultural business actors can optimize their income and increase the sustainability of the local economy. Operational efficiency can also help in creating new jobs in the agricultural sector, as well as increasing farmers' competitiveness and participation in global markets. Therefore, efficiency in post-harvest handling not only provides economic benefits, but also has an impact on the social welfare of the agricultural community as a whole.

2. Waste Reduction

Waste reduction is one of the important implications of innovation in post-harvest handling in sustainable agribusiness management. By implementing efficient post-harvest technology, such as using appropriate storage techniques or processing agricultural waste into value-added products, agricultural waste can be minimized or even used productively. This helps reduce negative environmental impacts caused by the accumulation of agricultural waste, such as water and air pollution, and extends the life of agricultural land by reducing the accumulation of non-decomposing organic waste. In addition, waste reduction also contributes to increasing the efficiency of natural resource use, which is in line with the principles of ecological sustainability.

In addition to environmental benefits, waste reduction also has a significant economic impact in the context of sustainable agribusiness management. By reducing waste and utilizing it effectively, farmers and agricultural businesses can reduce their operational costs, such as waste management costs or processing and disposal costs. Additionally, by utilizing waste as an

additional resource, such as organic fertilizer or raw material for the bioenergy industry, they can create additional sustainable sources of income. This helps increase farmers' economic resilience and reduces dependence on expensive agricultural inputs or reliance on government subsidies.

Furthermore, waste reduction also has positive social implications in sustainable agribusiness management. By minimizing agricultural waste, agricultural practices become cleaner and more environmentally friendly, which can improve the quality of life and health of local communities. In addition, the use of waste as an additional resource can also help in creating new jobs in the agricultural sector and related industries, as well as providing educational and training opportunities in waste management and processing technology. Therefore, waste reduction not only brings environmental and economic benefits, but also contributes to social welfare and sustainable community development.

3. Increasing Added Value

Innovation in post-harvest handling plays an important role in increasing the added value and competitiveness of agricultural products in the global market. With advanced post-harvest handling technology, agricultural products can be processed, packaged and stored in a way that allows them to maintain their quality for longer. For example, the use of controlled atmospheres in vacuum storage and packaging can help slow the rate of product aging and reduce the risk of damage. Techniques like these open up opportunities for farmers to export their products to international markets with a high level of confidence, because the quality is well maintained during long-distance travel.

Apart from that, innovation in post-harvest handling also enables the development of more diverse and market-oriented agricultural products. By using advanced packaging technology, agricultural products can be processed into various attractive shapes and packaging, increasing market attractiveness for increasingly diverse consumers. For example, agricultural products can be packaged in environmentally friendly, practical or aesthetically pleasing packaging, which increases the product's competitiveness on store and supermarket shelves. Thus, innovations in post-harvest handling not only increase the added value of products, but also help farmers to adapt to changing market demands and increase marketing opportunities for their products.

Lastly, increasing the competitiveness of agricultural products through innovation in post-harvest handling also provides significant economic benefits for farmers and other agricultural business actors. By improving product quality and attractiveness, farmers can sell their products at better prices, increase their income, and expand their market share. This not only improves the economic welfare of farmers, but also supports the growth and sustainability of the agricultural sector as a whole. Thus, innovation in post-harvest handling not only provides direct benefits for farmers, but also contributes to economic growth and inclusive rural development.

4. Increasing Farmer Welfare

Increasing farmer welfare is one of the significant implications of innovation in post-harvest handling in sustainable agribusiness management. By introducing efficient and effective post-harvest technology, farmers can optimize their crop yields, reduce post-harvest losses, and increase the added value of their products. This in turn can lead to an increase in farmers' income

and their economic well-being. By having better access to markets and higher quality products, farmers can increase their competitiveness and have a better chance of thriving in the competitive agricultural industry.

Apart from that, improving farmer welfare can also encourage local economic sustainability and strengthen agricultural communities. By having better income, farmers can reinvest in developing their own businesses or in community development projects, such as agricultural infrastructure or education and health programs. This helps improve the quality of life and access to basic services for farmers and their families, and supports inclusive and sustainable economic growth in rural areas. As a result, local employment opportunities can increase, urban migration can decrease, and rural communities can become more self-sufficient and economically stable.

Lastly, improving farmer welfare can also have a positive impact on social and cultural aspects in agricultural communities. By having more stable economic conditions and better incomes, farmers can focus more on sustainable agricultural practices, environmental stewardship, and preserving local traditions. This can strengthen cultural identity and social sustainability in agricultural communities, as well as strengthen relationships between farmers and solidarity in facing common challenges. Thus, improving farmer welfare through innovation in post-harvest handling not only provides economic benefits, but also strengthens social, cultural and environmental aspects in sustainable agribusiness management.

5. Improved Food Safety

Increasing food safety is the main implication of innovation in post-harvest handling in sustainable agribusiness management. By using advanced post-harvest technologies, such as controlled preservation systems and hygienic packaging, agricultural products can be processed and stored in a way that minimizes the risk of pathogenic microbial contamination. This helps ensure that agricultural products that reach consumers are safe for consumption, reduces the risk of foodborne illness, and increases consumer confidence in agricultural products. Thus, improving food safety through innovation in post-harvest handling not only provides health benefits for consumers, but also supports sustainable development goals in meeting global needs for safe and healthy food.

Apart from that, innovation in post-harvest handling can also help reduce crop losses due to damage or spoilage during storage and distribution. With advanced storage technology and appropriate packaging processes, agricultural products can be maintained in optimal condition for longer, reducing the risk of quality degradation or damage caused by environmental changes or physical manipulation during transportation. This helps maintain stable and sustainable food availability in local and global markets, and helps reduce inequalities in access to healthy and quality food. Thus, innovation in post-harvest handling not only improves food safety, but also supports overall food security in society.

Finally, improving food safety through innovation in post-harvest handling can also have a positive impact on socio-economic aspects in agricultural communities. By reducing crop losses and improving product quality, farmers can obtain a more stable and sustainable income. This can

help reduce poverty in rural areas, improve the welfare of farmers, and create new jobs in the agricultural and related agribusiness sectors. Thus, improving food safety through innovation in post-harvest handling not only provides health and economic benefits, but also contributes to inclusive and sustainable social and economic development in society.

D. CONCLUSION

Sustainable agribusiness management plays a crucial role in changing the paradigm of agricultural practices towards a more balanced and sustainable system. This concept not only covers environmental aspects, but also pays attention to economic and social sustainability in the entire food supply chain. The importance of post-harvest innovation in this context lies in its ability to reduce losses in the supply chain, improve product quality, and support sustainable food security. By applying appropriate post-harvest handling technology and practices, both for plantation commodities, seeds, food crops and horticultural products, we can ensure that agricultural production is not only economically sustainable, but also socially and environmentally. Thus, sustainable agribusiness management is the key to building a more resilient, responsive and fair agricultural future for all parties involved.

Post-harvest innovation has a significant impact in maintaining the sustainability of agricultural businesses. With the adoption of the latest technology, the process of handling, processing and storing agricultural produce has become more efficient, helping farmers reduce crop losses and increase their productivity. In addition, the use of environmentally friendly technology helps reduce waste of natural resources and the carbon footprint in the agricultural process. The impact is not only felt in economic terms, where farmers gain more stable incomes and increase the competitiveness of their products in the global market, but also in social welfare and development of rural communities. Reducing waste and increasing the added value of products also opens up new opportunities for farmers, with the potential to create additional jobs and strengthen the local economy. On the other hand, improving food safety ensures that the agricultural products produced meet high quality standards, providing confidence to consumers and supporting sustainable development goals in meeting global needs for safe and healthy food.

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