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# Strategic Problem Solving and Technology Adoption : Integration of Eco-Enzyme Innovation in Small-Scale Coffee Business Management.

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**Abstract**

*Strategic problem-solving and technology adoption are crucial factors in the decision-making and business communication process in the agricultural sector. Amid a complex work environment and increasing operational challenges, there is an urgent need for precision agriculture technology among small-scale coffee farmers. A combination of fine skills, data-driven insights and organic innovations such as eco-enzymes is needed by society to succeed in modern agribusiness. For a successful small-scale coffee business, a decision support system (DSS) plays an effective and efficient role. Good technology adoption aims to build better relationships with the environment and stakeholders. In addition, it also aims to provide quality solutions to existing productivity problems that arise in the agricultural business environment. This eases future production conflicts and resource constraints. This inherent quality enhances business continuity and economic empowerment among farming communities. This article attempts to analyze the need for precision problem-solving and eco-enzyme innovation in the world of agricultural business management. Furthermore, this article explains the importance and analyzes the strategic need for the adoption of technology as a major asset in today's competitive coffee business world.*

**Keywords: Business Management, Technology Adoption, Eco-enzyme, Bsnis Coffee Scale Small.**



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## INTRODUCTION

The adoption of good technology and problem-solving skills helps to avoid future problems and production conflicts in the agricultural arena. This integration promotes better logical solutions when we work and deal with complex environmental and economic problems on small-scale plantations. In the context of agribusiness development, previous studies have highlighted the importance of technology adoption to increase smallholder productivity. For example, a study by Alavoine, Claude et al. (2014), confirms that digitalization in the agricultural sector can significantly reduce input costs if managed with the right support system. In addition, research from Rahayu et al. (2023) shows that organic innovations, such as the use of eco-enzymes, have great potential in improving soil health and improving the quality of coffee beans.




Figure 1. Eco Enzyme Manufacturing fFow in Coffee Commodities

This research offers novelty through the development of a precision-based agribusiness management model that combines DSS technology with the use of local resources in the form of eco-enzymes. In contrast to previous research that tended to focus separately, this research integrates the two into a strategic problem-solving framework. To achieve this goal, this study uses a comprehensive mixed-methods research. A quantitative approach was applied to measure the variables of economic efficiency (B/C ratio) and crop yield improvement through field experiments with coffee farmer groups in Enrekang. On the other hand, a qualitative approach is used to understand the dynamics of farmers' behavior in adopting these new innovations. (Alwi et al., 2025) (Irmayani et al., 2020)

Overall, the integration of these methods not only provides empirical evidence regarding the impact of productivity, but also maps out managerial strategies that can be replicated by other farmer groups. The objectives of this research are • Understand the important aspects of strategic problem solving in agriculture 1. Recognizing the urgent need for technology adoption techniques in the world of coffee business, 2. Appreciate


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the key elements of eco-enzyme innovation and Decision support systems, 3. Understand the factors that affect the integration of technology and farm management (Stuttgart et al., 2024)

## DISCUSSION

The importance of *eco-enzyme innovation* in the context of coffee cultivation cannot be separated from efforts to achieve organic farming standards with high economic value. *Eco-enzymes* act as biological catalysts capable of continuously improving the physical, chemical, and biological structure of soils. In the long term, the use of *eco-enzymes* with precision has been proven to be able to reduce synthetic chemical residues in coffee beans, thereby increasing the selling value of products in the international market which is now increasingly selective towards environmentally friendly products. This innovation is not just an alternative fertilizer, but a foundation for agricultural ecosystems that are resilient to climate (Stuttgart et al., 2024b)

On the other hand, professional business management is the backbone of the sustainability of coffee agribusiness at the farmer level. Many small-scale coffee farming businesses often fail to develop due to a lack of systematic business planning and operational management. The application of management functions—from planning, *organizing*, *actuating*, to controlling—greatly determines how technologies such as DSS and innovations such as *eco-enzymes* are optimized. Without good governance, no matter how sophisticated the technology adopted will not have a significant economic impact on farmers' welfare (Siswanto et al., 2025)

The synergy between *eco-enzyme* innovation and strong business management creates an independent and competitive farming model. When farmers are able to manage local resources (as raw materials (Ali, 2024) *for eco-enzymes*) and implement data-driven decisions (through DSS) in a unified management system, they go from being mere commodity producers to profit- and sustainability-oriented agribusiness actors. This integration gives farmers full control over production costs while maintaining product quality at every stage of the coffee supply chain, which will ultimately strengthen farmers' bargaining position in the dynamic coffee (Chauhan et al., 2021)

The adoption of precision technology and the integration *of eco-enzymes* led to the settlement of agricultural disputes and debates regarding the dependence of chemicals in business settings. Farm managers and farmers are expected to explore various alternatives in solving productivity problems. Problem-solving skills are key to getting ahead in agribusiness settings and further help resolve input cost conflicts. In


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order to maintain environmental relations, it is very important to resolve ecological conflicts (Irmayani, Ilmi, et al., 2024)

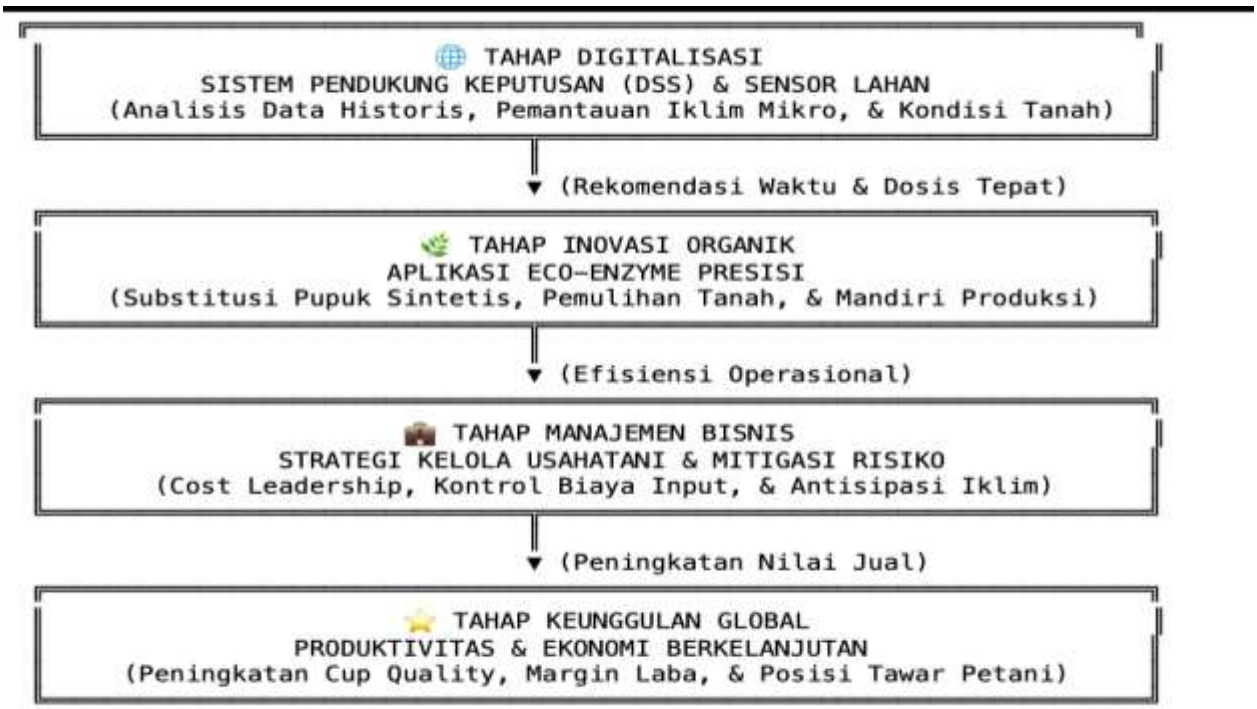



Figure 2. Stages of Business Management at Usahtani Kopi

Five-Step Process in Precision Business Management:

1. Preparation and planning: Basic data collection and land assessment.
2. Definition: Identify specific productivity barriers and chemical dependencies.
3. *Clarification*: Align agronomist needs with local *eco-enzyme* resources.
4. Troubleshooting: Execute precision applications through Decision Support Systems.
5. Implementation: Monitor crop yields, cost reduction, and economic empowerment.

(Irmayani, Mochinta, et al., 2024) The implementation of a decision support system (DSS) in coffee management is not just a tool, but a digital transformation that allows farmers to make *evidence-based decision-making*. By integrating historical land data,


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DSS is able to predict the best time for *eco-enzyme* applications, thereby maximizing the efficiency of nutrient uptake by coffee plants. This directly reduces the inefficiencies that often occur in conventional methods where farmers often overuse chemical inputs due to a lack of precise data on crop needs (Yoansyah et al., 2020)

In addition to the technical aspect, the aspect of strategic communication within the farmer group is also a crucial point that needs to be emphasized. The adoption of new technologies is often hampered by cultural resistance or a lack of understanding of the mechanisms of innovation. Therefore, agribusiness managers must play the role of communicators who are able to translate the complexity of technology into a language that is understood by farmers, so as to create a sense of trust which is the main foundation in every cooperation agreement and the adoption of innovations in the field. The importance of cost management in a small-scale coffee business is also the main focus in this discussion. Through the use (Nurhamidah et al., 2021) *of eco-enzymes* produced independently, farmers are able to substitute high input costs with production costs that are close to zero if they utilize local agricultural waste. These cost savings directly contribute to the increase in the net profit margin of farms. From a managerial economic perspective, this is a form of cost *leadership* strategy that is very effective for business entities at the rural level.

Historically, looking at the dynamics of the world coffee market, the bargaining position of farmers is highly determined by product quality (*cup quality*). *Eco-enzyme innovations* that are applied with precision have been proven to be able to improve the taste profile of coffee through the fulfillment of balanced nutrition, which in turn will attract buyers in the specialty coffee segment. Thus, good management is not only about production quantity, but also about how to maintain quality to get into a more profitable global supply chain. Furthermore, the discussion of risk management in agriculture becomes relevant when we talk about technology adoption. . Extreme climate change is a real threat to coffee farmers in Enrekang. With DSS monitoring the microclimate in (Rahma & Izzuddin, 2023) *real-time*, farmers can be better prepared to deal with weather anomalies through rapid mitigation measures. This is what is meant by strategic problem solving, where technology is used as an instrument to anticipate potential losses before they occur. The integration *of eco-enzymes* and business management also strengthens the social and ecological sustainability aspect (Abdullah et al., 2023)

Socially, this increases the capacity of farmers' human resources in mastering technological literacy. Ecologically, it restores the carrying capacity of the land through the reduction of chemical load. The combination of the two forms a resilient agribusiness


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model. This model is particularly relevant to be adopted on a wider scale, both through government assistance schemes and independent initiatives from coffee farmers' associations (Irmayani, Mochinta, et al., 2024)

To conclude this part of the discussion, it should be emphasized that there are no shortcuts to success in a small-scale coffee business. The synergy between technical innovation, managerial agility, and the willingness to adapt to new technologies is the main recipe. When these three elements come together, small-scale farmers' coffee businesses will transform from a mere survival activity to a productive business that provides sustainable well-being for the community and preserves the environment for future generations

## CONCLUSION

The success of small-scale coffee business management is highly dependent on the ability of farmers and agribusiness actors to integrate strategic problem-solving with the adoption of precision technology. The use of the *Decision Support System* (DSS) has been proven to be able to transform traditional reactive farming patterns into data-driven proactive management, so that operational obstacles and production uncertainties can be systematically overcome. On the other hand, the application of *eco-enzyme* innovation not only functions as a solution to restore soil health and improve the quality profile of coffee beans (*cup quality*), but also becomes a key strategy in reducing chemical input costs through the principle *of cost leadership*. This synergy between managerial agility, digital transformation, and the use of local biotechnology ultimately not only strengthens farmers' bargaining position and economic profitability in the global market, but also realizes a sustainable coffee agribusiness model that is resilient to environmental crises and climate change.

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