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MORALITY BEFORE KNOWLEDGE

TaniMart: Integrated agricultural marketing based on village-owned enterprises and blockchain technology to achieve modern agricultural technology in accordance with good distribution practice

Bagus Aradea[1], Mufadlotul Izzah[1], Lusi Septiani[1]*

[1] *Study Program of Agrotechnology, Faculty of Agriculture, Universitas Tidar, Magelang, Central Java 56116, Indonesia.*

*Correspondence: bagus.aradea@untidar.ac.id

ABSTRACT

Background: The main challenges that is very crucial in modern agriculture is an effort to increase efficiency, transparency, and competitiveness of agricultural products. The implementation of modern agricultural technology still faces various challenges. Tanimart is based on village-owned enterprises and Blockchain to realize marketing of agricultural products in accordance with Good Distribution Practice to achieve modern agricultural technology. **Methods**: This element should describe the general procedures or technique, data collection technique, and analytical methods. Likewise, if the study is literature review, then the author should state the theoretical component. **Findings:** : This program is implemented through cooperation with village-owned enterprises. Tanimart is formulated by being characterized by Smart (Specific, Measurable, Acceptable, Realistic, Time Bound). Analysis of the development of Tanimart's ideas uses utilizing the concept of Public Relationship (PR), Roadshow, and Key Opinion Leader Endorsment Key Opinion Leader (KOL). This application offers double features, namely for farmers and consumers. The features include monitoring the harvest period. Tracking product stock, training, consultation, and farmers' community. **Conclusion**: The Tanimart application is designed to be realized within 12 months. **Novelty/Originality of this article:** Through the Tanimart application, it is expected to provide effective policy and strategy recommendations to overcome the obstacles or challenges of the era and accelerate the adoption of blockchain technology.

KEYWORDS: TaniMart, blockchain, agricultural marketing, village-owned enterprises.

1. Introduction

The rapid growth of the digital era has significantly driven the agricultural sector to transform. The application of information and communication technology has changed the way farmers cultivate, harvest, and market their produce (Burhan, 2018). This digital transformation in the modern era has elevated the agricultural sector in addressing global challenges such as climate change, population growth, and the increasing demand for agricultural food products (Lagiman, 2020).

One of the most critical challenges in modern agriculture is the effort to enhance efficiency, transparency, and competitiveness of agricultural products. Intense global competition demands that Indonesian farmers produce high-quality agricultural products

capable of penetrating export markets. Efforts to achieve this include optimizing the use of agricultural technology, establishing transparent supply chain systems, and improving the quality of human resources in the agricultural sector (Jaya et al., 2020).

Indonesia's agricultural sector, dominated by small-scale farmers, still faces various obstacles in marketing its products. Limited market access, especially for local premium products, often hinders farmers' income growth. The lack of accurate information regarding market prices, cultivation technologies, and business opportunities is also a challenge. The prevalence of fraudulent practices by middlemen or intermediaries further exacerbates the situation, causing significant economic losses for farmers. Consequently, many farmers find themselves trapped in a cycle of poverty and are reluctant to continue their agricultural endeavors (Maihani & Elfiana, 2016).

Blockchain technology is a securely distributed digital ledger. Every transaction that occurs is recorded in blocks, which are then linked in a continuously growing chain. Tracking the origin of a product at every stage in the supply chain, from planting to distribution, can be detailed. Consumers can verify where the product originated, how it was grown, and whether it met specific quality standards (Raharjo, 2022). One advantage of the Blockchain method is increased transparency, as all parties involved in the supply chain can access the same information in real-time. This helps reduce mistrust and improves business process efficiency. It also prevents counterfeiting, as every transaction is permanently recorded, making it difficult to falsify products or related data, thereby enhancing food safety (Musana, 2023). Blockchain can help trace food contamination and recall contaminated products more quickly, making payments easier. Payment transactions can be conducted directly and transparently between farmers and buyers without the need for intermediaries (Rukmana et al., 2023). The benefits of Blockchain for agriculture include increasing consumer trust, improving efficiency, and making business processes more efficient, as all information is centralized and transparent. The transparency provided by Blockchain increases consumer confidence in agricultural products, as they can track the product's journey and ensure that it comes from reliable and quality sources (Arwani & Privasi, 2024).

Modern Agricultural Technology plays an essential role in modernizing the marketing of agricultural products, opening new opportunities to increase efficiency, market reach, and profitability for farmers. The following are some examples of modern technology applied in the marketing of agricultural products. Blockchain technology on the TaniMart application serves as an Agricultural Marketplace that connects farmers with buyers, such as consumers, restaurants, and retailers, enabling direct sales and the elimination of intermediaries. The use of Modern Agricultural Technology in marketing products can be done through the TaniMart application, which allows farmers to track orders, manage inventory, and communicate with buyers (Setyawati, 2024).

Modern Agricultural Technology in product marketing also functions as market mapping, used to map the locations of markets and potential consumers, helping farmers determine effective distribution strategies. Additionally, it can help analyze market trends, demand, and competition, enabling farmers to optimize their marketing strategies. Supply monitoring can track the movement and availability of crops, assisting in supply management and avoiding losses (Sari et al., 2024).

Therefore, a system is needed to ensure transaction security, information transparency, and efficiency in the supply chain. The Blockchain-based TaniMart application has the capability to securely and transparently record transactions, offering an innovative solution to these problems (Martina, 2024). Although Blockchain technology offers significant potential for agricultural revolution, its implementation still faces various challenges. Low adoption rates among farmers, particularly in rural areas, unclear regulations, and a lack of supporting infrastructure are also obstacles.

This paper examines the application of Blockchain technology in building an integrated agricultural marketing system in Indonesia through the analysis of existing implementation cases to formulate a Blockchain-based agricultural marketing model that fits the local context and can improve farmer welfare. The concept of Blockchain-based integrated

agricultural marketing is seen as an effort to achieve Modern Agricultural Technology. This paper aims to provide policy recommendations and effective strategies to overcome the challenges of the era and accelerate the adoption of Blockchain technology.

2. Methods

The research utilizes two primary methods: experimentation and literature review. The experimental method is applied to demonstrate and test the research hypothesis through practical experience. In this study, the experiment involves the development of a prototype for the Tani Mart application, which includes various features designed to address the handling of agricultural products from pre-production, post-production, to marketing stages. This prototype aims to provide a comprehensive solution for improving the efficiency of agricultural practices and marketing strategies, particularly by directly connecting farmers with consumers. The experiment seeks to verify the effectiveness of the application in supporting agricultural product management, from cultivation to distribution, while enhancing transparency and reducing the need for intermediaries.

The literature review method, on the other hand, is used to evaluate existing concepts and theories based on previous studies. This approach involves analyzing scientific journals and articles relevant to agricultural product marketing, particularly post-harvest. The literature review provides a foundation for understanding current practices and challenges in the agricultural sector, and helps in identifying the key features that should be incorporated into the Tani Mart application. By referencing a wide range of sources, this research ensures that the application's design aligns with the needs of both farmers, as producers, and the general public, as consumers, fostering a more efficient and transparent agricultural marketing system.

3. Results and Discussion

3.1 Formulation and development targets of Blockchain-Based TaniMart

The formulation of development targets for Blockchain-based TaniMart through Village-Owned Enterprises aims to enhance agricultural product marketing in alignment with Good Distribution Practice (GDP). The development strategy follows the SMART criteria as follows.

Spesific, the blockchain and village-owned enterprises-based TaniMart represents a technological development strategy for marketing agricultural and food commodities, following the principles of Good Distribution Practice. This off-farm activity encompasses methods for post-harvest handling and market access. The implementation design defines the program's objective, which aims to enhance the welfare of farmers in Magelang by aligning support with their production volume. Farmers are categorized into two groups: local farmers and export-oriented farmers, based on market segmentation. The distribution of intensification programs is prioritized according to farmers' production capacities, with each farmer assigned a market segment that corresponds to their production level.

Village-owned enterprises plays a pivotal role as the entity managing funds for improving horticultural products, particularly in Magelang Regency. TaniMart is implemented as an empowerment program, presented through an online system accessible to users and stakeholders. The TaniMart application was chosen as the platform due to its flexibility and accessibility across various devices, including personal computers (PCs) and smartphones, and supported by Android or iPhone operating systems. The application is equipped with multiple features such as camera integration, data storage, galleries, and contact management, making it a faster and more versatile solution for agricultural marketing.

The application's interface begins with a login page, featuring a menu where users can either log in or register. Existing users can log in using their name and the last six digits of

their national identification number (NIK). Meanwhile, new users can register by providing personal information and completing a verification process. This structure ensures accessibility and ease of use for both farmers and consumers.

Figure 1. TaniMart home menu

On this menu page, there is important information presented in the form of sub-menus used to manage and display data, including Harvest Phase Monitoring, Product Stock Asset Tracking, Market Information, Training and Consultation, and Farmer Community.

Figure 2. Farmer features in the TaniMart Application

Integrated agricultural marketing is an approach that combines various aspects of marketing agricultural products, from production (up to the harvesting process) to consumption. The goal of integrated marketing is to create a system that is efficient, effective, and sustainable, while also enhancing added value for all parties involved and serving as a connecting feature between sellers and consumers. Marketing through blockchain technology can improve productivity and quality, meet market and regulatory requirements (product standardization), obtain product certification to boost consumer trust, and reach consumers across various regions due to its digital nature.

The TaniMart application offers several features specifically designed to support farmers and strengthen the agricultural supply chain. First, the Vertical Integration feature connects various stages of the supply chain, starting from production, processing, and

distribution, all the way to marketing. This process begins with market analysis, followed by production planning, distribution planning, and promotional strategies to optimize the flow of goods. Second, the Partnerships feature focuses on building strong relationships among farmers, processors, distributors, and consumers to create a more sustainable and collaborative ecosystem. Third, the Quality Assurance feature ensures that agricultural products meet high standards throughout the entire supply chain, with support from key stakeholders such as the National Agency of Drug and Food Control (BPOM), the Ministry of Agriculture, and local agricultural and industrial offices. Lastly, the Customer Service feature is dedicated to delivering excellent service to consumers, covering everything from assisting with product selection to providing post-sale support, thereby enhancing customer satisfaction and loyalty.

Figure 3. Farmer features in the TaniMart application

Measurable, the TaniMart application is designed for the marketing of agricultural production, starting from post-harvest handling to the marketing of the produced goods, which includes small-scale testing (pilot project) before gaining access to larger markets. The data obtained from these trials will later be utilized in larger-scale programs. This pilot project includes testing, data collection, analysis, and reporting. The program is implemented in collaboration with village-owned enterprises. The pilot project phase for testing the TaniMart application is conducted after establishing the objectives of the empowerment program, involving the collection of information regarding the needs for program development and the establishment of benchmarks. It is expected that this integrated empowerment program will enhance the economic condition of the community by opening up new market segments and boosting the potential of farmers in Magelang to produce better, competitive agricultural products, thereby increasing economic value through expanded market access.

Acceptable, the TaniMart application is designed to be free from elements of SARA (Suku, Agama, Ras, and Antargolongan) and pornography. This application is also an effort to realize Goal 8 of the Sustainable Development Goals (SDGs), gradually achieving all points in the SDGs to reach Sustainable Agriculture. To ensure the application is accepted and adopted by farmers in Magelang and aligns with its primary objectives without violating laws, norms, and morals, support and training are necessary. This includes managing and maintaining facilities, production control, marketing management, and financial management (reviewing transaction records to determine cost price, selling price, and profits).

The execution of the program requires support from various parties to be effective. The empowerment program for farmers highlights local potential, which can yield maximum results. Technology plays a significant role in implementing this program, opening food market segments through an integrated mobile application platform. This empowerment program also serves as a trial for applying and empowering farmers in Magelang, making it highly feasible for implementation.

Time-bound, the implementation process of TaniMart requires approximately one year to achieve the desired results. This timeline begins with the initial stage of identifying and convincing partners and securing funding for research to support product commercialization. Following this, there will be preparation of research materials, assembly, testing, evaluation, and distribution of the application. Evaluation is a crucial stage of the program that involves assessment and review. This evaluation serves two roles: normative and summative. It is conducted to determine the success level of the program and to inform decisions regarding the continuation of support and training for farmers in Magelang.

In analyzing the achievement targets and the development of the TaniMart concept, several technical steps are strategically outlined within the implementation mechanism. First, Public Relations (PR) efforts are essential to establish a positive business brand among consumers and the broader community while also evaluating public attitudes and perceptions toward the realization of TaniMart. This involves promotional activities through strategies such as Product Publicity and Corporate Communication. Product Publicity focuses on introducing TaniMart through influencers and social media platforms, while Corporate Communication involves designing marketing and promotional strategies aimed at a broader audience, particularly farmers and consumers, to highlight the marketing of agricultural products. Second, the Roadshow, conducted through workshops or webinar series, aims to provide information and product introductions to partners and entrepreneurs (investors) who play a critical role in the success of the program. The feedback gathered during these events helps improve the marketing strategies for horticultural products in Magelang, with village-owned enterprises serving as crucial facilitators to bridge the marketing of agricultural products. Third, Key Opinion Leader (KOL) Endorsement is utilized, involving trusted public figures such as governors and regents who can significantly enhance brand awareness for TaniMart. Promoting the relevance and importance of the TaniMart program directly through government officials and village-owned enterprises is vital for ensuring the program's success and expanding market opportunities for farmers.

3.2 Work plan for tanimart in the manifestation of modern agricultural technology

The work plan for the implementation of the creative innovation concept of pesticide residue detection caps is detailed in the following stages:

Table 1. Workplan for the implementation of the creative concept of pesticide residue detection

Stage 1 (3 months)	Stage 2 (1 month)
Search for funding partners: Universitas Tidar, Bappeda Magelang, Balitbangda, and the Department of Agriculture.	Preparation of the TaniMart research proposal for funding submission, along with coordination with stakeholders related to the research theme, including the Ministry of Agriculture and Food Security of the Republic of Indonesia and private sector partners.
Stage 3 (2 months)	Stage 4 (3 months)
Conduct scientific research, which includes programming the TaniMart application.	Testing the TaniMart application prototype and conducting pilot projects.

Stage 5 (1 month) Socialization of the TaniMart application to stakeholders and the community, especially farmers and the Magelang Department of Agriculture.	Stage 6 (1 month) Campaign on the importance of health and safety in the agricultural sector and marketing according to Good Distribution Practice.
Stage 7 (1 month) Monitoring and evaluating the success of the implementation of the concept.	

3.3 Visualization of the Idea

The mechanism for visualizing the implementation of TaniMart, aimed at encouraging the adoption of innovation by farmers, consists of several essential steps. First, it involves identifying the possibilities and challenges associated with assessing the needs of farmers in Magelang. This encompasses addressing various issues, conducting a needs analysis, and planning equipment designs as solutions to the challenges faced by farmers during economic crises. Following this, the next crucial step is data collection, which plays a vital role in determining environmental needs. During this phase, activities such as observation, literature reviews, and data analysis are conducted to develop a targeted program design. The initial step in designing equipment includes integrating stakeholders, establishing TaniMart, and recruiting expert teams and field engineers, preparing necessary attributes for program implementation.

After completing all preliminary preparations, the search for funding partners commences, focusing on entrepreneurs involved in circular economy development and Village-Owned Enterprises. The goals set for the program are realized through the launch of TaniMart and its accompanying application in collaboration with integrated business partners. This program aims to provide various attractive promotions to consumers and stimulate interest among village farmers to join TaniMart. Additionally, collecting data on complaints and contributions from partners, farmers, and consumers is critical for market validation and overall program success. Data input is gathered from various stakeholders to facilitate continuous improvement, employing both offline and online surveys to ensure an accurate assessment of consumer needs. Planning and developing the program further are essential, as the program's flow and the TaniMart platform's realization require refinement and enhancement. Regular evaluations, involving village-owned enterprises, business partners, farmers, field experts, and technical teams, will be conducted monthly to assess the system's overall operation and ensure its effectiveness.

3.4 Development program

The empowerment of farmers in Magelang Regency aims to realize the TaniMart initiative, focusing on programs designed to enhance productivity. The "Bina Tani" program emphasizes the intensification of agricultural products by providing regular training sessions to help improve farming outputs. This initiative will be spearheaded by experts in the agricultural sector who possess significant skills and field experience, ensuring that the training is practical and relevant to the farmers' needs.

Additionally, the "Bina Pangan" program will offer educational support at the beginning of each planting season. This program will be monitored by Village-Owned Enterprises, which will provide farmers with appropriate access to subsidies and assistance. Another critical component is the "Bina Pasar" program, which focuses on market development by connecting farmers to both national and international digital marketplaces. Through digital sales initiatives, farmers will have the opportunity to sell their agricultural products across Indonesia and engage in international trade under specific terms. This digital market innovation is expected to enable farmers to sell their harvests at relatively higher prices, thereby enhancing their overall welfare and contributing to economic growth in the region.

3.5 Key stakeholders

Collaboration among stakeholders holds significant potential to drive innovation, education, resource access, and sustainable technology development. The TaniMart initiative employs a pentahelix model through Village-Owned Enterprises, which allows for the identification of the roles of various stakeholders, including analyzing the achievement targets and the development of the TaniMart concept, several technical steps are strategically outlined within the implementation mechanism. First, Public Relations (PR) efforts are essential to establish a positive business brand among consumers and the broader community while also evaluating public attitudes and perceptions toward the realization of TaniMart.

This involves promotional activities through strategies such as Product Publicity and Corporate Communication. Product Publicity focuses on introducing TaniMart through influencers and social media platforms, while Corporate Communication involves designing marketing and promotional strategies aimed at a broader audience, particularly farmers and consumers, to highlight the marketing of agricultural products. Second, the Roadshow, conducted through workshops or webinar series, aims to provide information and product introductions to partners and entrepreneurs (investors) who play a critical role in the success of the program. The feedback gathered during these events helps improve the marketing strategies for horticultural products in Magelang, with village-owned enterprises serving as crucial facilitators to bridge the marketing of agricultural products. Third, Key Opinion Leader (KOL) Endorsement is utilized, involving trusted public figures such as governors and regents who can significantly enhance brand awareness for TaniMart. Promoting the relevance and importance of the TaniMart program directly through government officials and village-owned enterprises is vital for ensuring the program's success and expanding market opportunities for farmers.

3.6 *SWOT analysis*

The SWOT analysis applies the framework analysis method, identifying Strengths, Weaknesses, Opportunities, and Threats, and distinguishing between internal and external factors respectively. The SWOT analysis for TaniMart :

Table 2. SWOT analysis of TaniMart

Strengths	Abundant Natural Resources: Magelang Regency possesses abundant natural resources for agriculture, such as fertile land, a suitable climate, and sufficient water sources. Technological Innovation: Advancements in agricultural technology and techniques have improved production efficiency and crop yields. Local Food Provision: TaniMart supports food provision specifically for the Magelang area, providing essential harvests that contribute to food sustainability. Supply Chain Transparency: Features that cover phases from harvest to the supply chain ensure consumer validation. Broader Market Information Access: Real-time market prices, demand trends, and new market potential are accessible. Efficiency in Marketing Processes: Direct marketing, order management, and supply chain tracking processes are streamlined. Communication Features: Features facilitate interactions between farmers and consumers, as well as between farmers and consultants. Collaborative Opportunities: Easy collaboration among farmers, such as participation in online communities, is facilitated.
Weaknesses	Limited Technology Access: Insufficient infrastructure and inadequate devices limit technology access. Low Digital Skills: Limited digital literacy and a lack of training contribute to low digital skills among farmers.

	Subscription and Data Costs: High subscription and data costs can be a financial burden for farmers. Low Trust in New Technology: Uncertainty or fear of change leads to low trust in new technologies. Network Dependence: Heavy reliance on network connectivity affects operational stability.
Opportunities	Enhancing Farmer Efficiency and Productivity: Improved access to market information, production planning, and inventory management can significantly enhance farmer efficiency and productivity. Expanding Networks: Broader connectivity with buyers and collaborations with other farmers can strengthen market reach and resilience. Improving Product Quality and Safety: Supply chain tracking and product certification can boost product quality and ensure safety. Access to Financing: Opportunities for agricultural credit and insurance funding support financial stability and growth. Increasing Farmer Knowledge: Educational initiatives and training can raise farmer knowledge and skill levels.
Threats	Climate Change: Climate change can lead to extreme weather events and unpredictable seasonal patterns, increasing the risk of crop failure. Limited Internet Access: Not all farmers have stable internet access, hindering their ability to utilize digital resources. Inadequate Digital Skills: Some farmers lack sufficient digital skills to effectively use applications. Unaffordable Usage Costs: The costs associated with technology use may be prohibitive for some farmers.

4. Conclusions

TaniMart, based on Village-Owned Enterprises and Blockchain technology, represents a strategic development in the marketing of agricultural and food commodities, incorporating Good Distribution Practice. The off-farm activities span methods for post-harvest handling and market access. The TaniMart application provides features tailored to farmers, including vertical integration, partnerships, quality management, and service enhancement, while consumer-focused features include product search, community support, review systems, ratings, and delivery tracking.

The application's approach to achieving its target goals involves Public Relations (PR), roadshows, and endorsements by Key Opinion Leaders (KOL). The TaniMart work plan begins with partner acquisition, research proposal drafting, scientific research, prototype testing, pilot project trials, socialization, campaign initiatives, and program monitoring and evaluation. Program visualization includes identifying potential and challenges, data collection, instrument design, promotion and partner acquisition, program and app launch, feedback gathering from partners, farmers, and consumers, and subsequent planning and program development. This phase is followed by joint evaluations, follow-up actions, and program finalization. The core components of TaniMart's outreach include farmer guidance, food security support, and market development.

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Author Contribution
B focuses on idea generation, target development analysis, and concept visualization. I contributes by analyzing the sustainability and evaluation of the concept, as well as sourcing

relevant literature. Meanwhile, L handles the analysis of the training program, application design, and literature review.

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Biographies of Authors

Bagus Aradea, Study Program of Agrotechnology, Faculty of Agriculture, Universitas Tidar, Magelang, Central Java 56116, Indonesia.
- Email: bagus.aradea@students.untidar.ac.id
- ORCID: 0009-0000-4363-6058
- Web of Science ResearcherID: LMP-9574-2024
- Scopus Author ID: N/A
- Homepage: N/A

Mufadlotul Izzah, Study Program of Agrotechnology, Faculty of Agriculture, Universitas Tidar, Magelang, Central Java 56116, Indonesia.
- Email: mfizzhfz@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Lusi Septiani, Study Program of Agrotechnology, Faculty of Agriculture, Universitas Tidar, Magelang, Central Java 56116, Indonesia.
- Email: septianilusi199@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A