Jurnal Syntax Imperatif: Jurnal Ilmu Sosial dan Pendidikan
Volume 6, No 5, November 2025, pp. 1276-1298
P-ISSN: 2721-2491 E-ISSN: 2721-2491
DOI: http://doi.org/10.54543/syntaximperatif.v6i5.804
Published By: CV. Rifainstitut

Greenhouse Fruit and Vegetable Picking Tourism Management Model Based on Circular Economy with Productive Waqf Approach to Support Food Independence of Ngajum Malang Prison

Ni`Matul Istiqomah[1*], Dwi Wulandari[2], Putra Hilmi Prayitno[3], Abdul Rahman Prasetyo[4], Ari Gunawan[5], Afis Baghiz Syafruddin[6], Widia Nur Indriati[7]

[1,2,3] Economic Development, Universitas Negeri Malang, Malang, Indonesia
[4] Art and Design, Universitas Negeri Malang, Malang, Indonesia
[5,7] Management, Universitas Negeri Malang, Malang, Indonesia
[6] Management, Universitas Gadjah Mada, Yogyakarta, Indonesia

ARTICLE INFO

Article history:
Received September 11, 2025
Revised December 20, 2025
Accepted December 24, 2025
Available online December 24, 2025

Kata Kunci:
Agroindustri Berkelanjutan; Rumah Kaca Cerdas; Sistem Hidroponik Menara

Keywords:
Circular Economy; Productive Waqf; Prison Food Independence

ABSTRAK

Kemandirian pangan di lembaga pemasyarakatan masih menjadi tantangan signifikan, khususnya dalam memenuhi kebutuhan gizi warga binaan secara mandiri dan berkelanjutan. Dengan menggunakan pendekatan ekonomi sirkular dan pemanfaatan wakaf produktif di Lapas Ngajum, Malang, artikel ini menawarkan solusi atas permasalahan pengelolaan wisata petik buah dan sayur berbasis rumah kaca (greenhouse). Selain berfokus pada hasil pertanian, model ini mengintegrasikan unsur pemberdayaan sosial warga binaan, ekonomi hijau, dan pendidikan. Dalam pengelolaan greenhouse, konsep ekonomi sirkular diterapkan melalui pemanfaatan limbah organik untuk pengomposan, daur ulang air, serta optimalisasi energi dan ruang guna menciptakan sistem pertanian tertutup (closed-loop) yang efisien dan ramah lingkungan. Sementara itu, pengelolaan lahan pertanian tidak lagi bergantung sepenuhnya pada anggaran negara, karena metode wakaf produktif memungkinkan perolehan dana berkelanjutan dari individu, lembaga, dan mitra filantropi. Analisis kebutuhan dan hasil observasi di Lapas Ngajum menunjukkan adanya potensi besar untuk mengintegrasikan kegiatan pertanian dengan program rehabilitasi serta pelatihan kerja berbasis keterampilan vokasional. Salah satu upaya untuk meningkatkan akses publik terhadap hasil karya warga binaan adalah melalui wisata edukasi petik buah dan sayur. Selain itu, pengembangan media pembelajaran, seperti praktik langsung, video, dan modul, bertujuan untuk meningkatkan pemahaman dan keterampilan peserta. Konseptualisasi model ini menunjukkan bahwa kolaborasi antara teknologi, pendidikan, dan ekonomi sosial melalui pendekatan ekonomi sirkular dan wakaf dapat menjadi fondasi yang kuat dalam mewujudkan ekosistem pertanian berkelanjutan di lembaga pemasyarakatan. Model ini diharapkan dapat diterapkan di institusi serupa lainnya guna memperkuat kemandirian pangan nasional serta mendukung transformasi sosial melalui rehabilitasi yang produktif.

ABSTRACT

Food independence in prisons remains a significant challenge, particularly in meeting the nutritional needs of inmates in a self-sustaining manner. Using a circular economy approach and the utilization of productive waqf in Ngajum Prison, Malang, this article offers a solution to the problem of managing greenhouse-based fruit and vegetable picking tourism. In addition to focusing on agricultural products, this model integrates elements of social empowerment of inmates, green economy, and education. In greenhouse management, the concept of circular economy is applied. This involves utilizing organic waste for composting, recycling water, and optimizing energy and space to create an efficient and environmentally friendly closed-loop farming system. Meanwhile, agricultural land management no longer depends solely on the state budget, as the productive waqf method obtains sustainable funds from individuals, institutions, and philanthropic partners. Analysis of needs and observations at Ngajum Prison indicate that there is significant potential to integrate agricultural activities with rehabilitation programs and vocational skills-based job training. One way to increase public access to the results of prison-fostered work is through educational fruit and vegetable picking tourism. Additionally, the

*Corresponding author
E-mail addresses: nimatul.istiqomah.fe@um.ac.id (Ni`Matul Istiqomah)

purpose of creating learning media, such as direct practice, videos, and modules, is to enhance participants' understanding and skills. The conceptualization of the model demonstrates that cooperation among technology, education, and social economy, through a circular and waqf approach, can provide a strong foundation for creating a sustainable agricultural ecosystem in prisons. This model is expected to be applied in other similar institutions to strengthen national food independence and support social transformation through productive rehabilitation.

1. INTRODUCTION

Given its strategic role in maintaining social, economic, and public health stability, food independence is currently a primary concern in various countries around the world. Increasingly extreme climate change is causing significant disruptions to food production patterns worldwide, including droughts, floods, and declining soil and water quality, which have a direct impact on the availability and affordability of food. Furthermore, the food crisis that has occurred in several countries has heightened the need for a more resilient and sustainable food system. Intensive industrial food systems, characterized by long supply chains and excessive chemical use, pose significant risks to food security and environmental balance. Agricultural policies can mitigate these impacts by lowering production costs and increasing farmers' resilience and motivation in facing risks (Lee et al., 2024). There are differences in food access between regions and community groups in Indonesia, which makes the problem of food independence more complex. Obtaining fresh and nutritious food remains challenging in many areas, particularly in rural and disadvantaged regions. The conversion of productive agricultural land to non-agricultural land significantly reduces the availability of land for staple food production, thereby disrupting food security (Mulyani et al., 2023). The struggle to increase national food production is also hindered by the limitations of increasingly narrow productive land resulting from land conversion.

On the other hand, modern technology in agricultural practices remains largely unevenly distributed, especially among farmers and institutions that have the potential, such as correctional institutions. Correctional institutions should be a place where individuals can improve their skills and be empowered. The adoption of agricultural technology in Indonesia still faces obstacles, mainly due to high costs and lack of training, which have an impact on low productivity and stagnant farmer wages (Ngadi et al., 2023). However, they are still not utilizing agricultural technology and sustainable agricultural practices effectively to support their internal food security. This condition presents both a challenge and an opportunity to develop an innovative, effective, and sustainable agricultural management model within the correctional institution environment, supporting food independence.

Correctional Institutions (Lapas) have a strategic role in social rehabilitation and empowerment of inmates. However, most prison programs still focus on traditional skills and have not emphasized contemporary, sustainable, and entrepreneurship-oriented agricultural models. Nevertheless, prisons have human resources and land that can be used to build a productive agrarian ecosystem. In Ngajum Malang Prison, an empowerment program that integrates food security is needed because inmates lack sufficient access to fresh food, entrepreneurship training, and post-release economic support. This program helps inmates develop agricultural skills that can be used after they are released (Devine-Wright et al., 2019).

Greenhouse fruit and vegetable picking tours are increasingly popular as a form of educational agrotourism that combines urban agriculture, environmental education, and local tourism attractions (Lo et al., 2021). This model has been shown to increase public interest in agriculture and create economic opportunities. However, such models are still rare in prison environments, especially when combined with more sustainable approaches, such as a circular economy system that emphasizes resource reuse, waste reduction, and supply chain efficiency. By reallocating agricultural land to avoid declining yields and taking advantage of

increasing yields, half (16%) of the total losses of farm profits caused by climate change can be avoided.

To date, research and practice have primarily focused on the development of village-based agrotourism, the management of productive waqf for the local economy, and the application of a circular economy in agriculture and micro and small enterprises (MSMEs). Agrotourism can be an answer to the demand for a circular economy and sustainable tourism, as well as a catalyst that can access subsidies under agricultural policies (Ingrassia et al., 2023). However, there has been no research that combines the three approaches of greenhouse agrotourism, circular economy, and productive waqf in the context of empowering correctional institutions. This indicates that there is still significant research space to be filled, particularly in developing models that are locally based, applicable, and have socio-economic value.

In a closed system such as prisons, agrotourism management also requires innovation in sustainable financing and management. With the principle of maintaining principal values and flowing sustainable profits, productive waqf can be a relevant alternative solution. Combined with the circular economy and green travel, productive waqf can be a key driver in building a high-impact and financially independent agro-tourism management system. This innovative farming model can be adapted in a correctional institution environment to create an efficient and sustainable agro-tourism system (Suebsombut et al., 2017). Therefore, as a strategic innovation to support food independence and empowerment of inmates at Ngajum Malang Prison, this study aims to develop a model for managing fruit and vegetable picking tourism in a greenhouse based on a circular economy with a productive waqf approach. It is hoped that this model can answer the need for productivity-based rehabilitation, increase institutional food security, and provide opportunities for multi-party collaboration in food production.

2. LITERATURE REVIEW

Circular Economy in Greenhouse Agrotourism Management

The development of the concept of traditional waqf into professionally managed assets to generate sustainable economic benefits in the form of increasing income, services, and improving community welfare is known as productive waqf (Suebsombut et al., 2017). This method has been used in various fields, such as education, health, and MSME empowerment, but it has not been widely developed to support agricultural or agro-tourism systems in correctional institutions. Productive waqf has the advantage of being able to provide authorized capital without reducing the principal value of waqf assets, which ensures that the program will last in the long term (Ningtyas et al., 2023).

Productive waqf can be an alternative solution to finance the productive activities of inmates such as skills training, agricultural management, and agro-tourism infrastructure development in the context of correctional institutions. This method not only provides the inmates with financial independence, but also creates a social ecosystem based on religious values and collective obligations (Anas & Aliansyah, 2022). Collaboration between waqf nadzir, Islamic financial institutions, and the government can make waqf a better social financial tool to build productivity-based rehabilitation programs. Productive waqf can be the main foundation for building structured, sustainable, and high social value independent food management in the prison environment when combined with a circular economy model and educational agro-tourism (Putra et al., 2023).

Productive Waqf as an Approach to Social Economic Empowerment

The development of the concept of traditional waqf into professionally managed assets to generate sustainable economic benefits in the form of increasing income, services, and improving community welfare is known as productive waqf (Costello & Osborne, 2005). This method has been used in various fields, such as education, health, and MSME empowerment, but it has not been widely developed to support agricultural or agro-tourism systems in correctional institutions. Productive waqf has the advantage of being able to provide authorized capital without reducing the principal value of waqf assets, which ensures that the program will last in the long term (Georgara et al., 2025).

3. RESEARCH METHOD

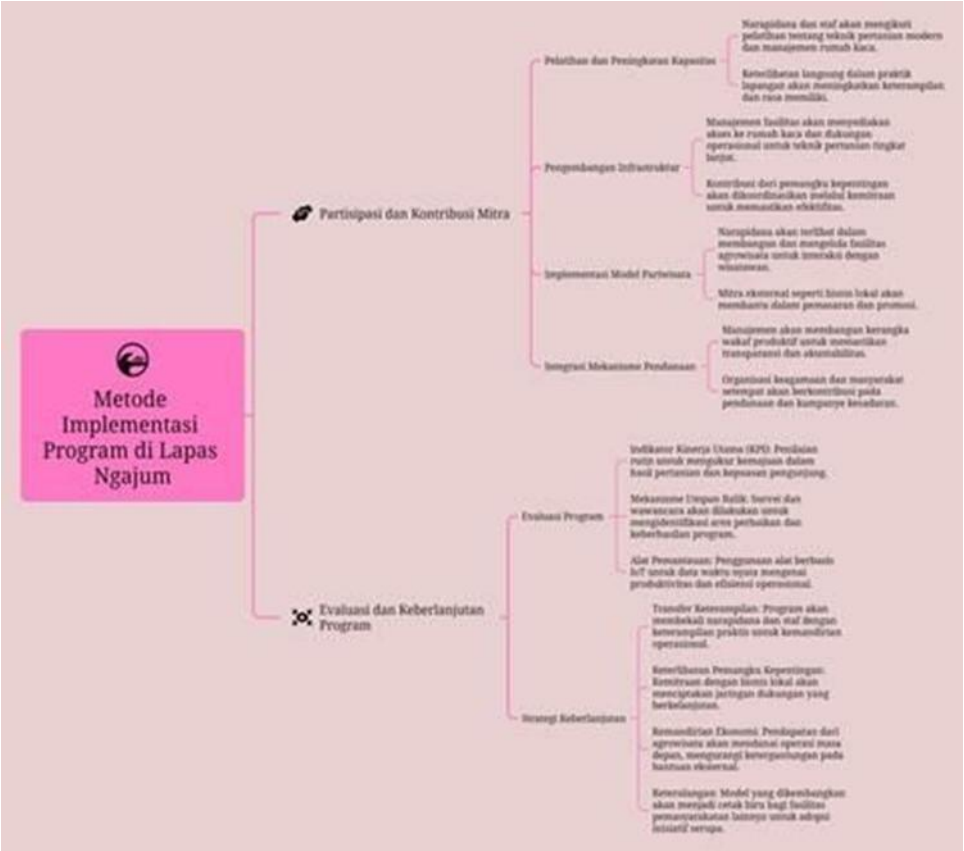

Figure 1. Implementation of Community Service

Implementation of the proposed solution involves systematic steps designed to address the identified problems effectively. Execution will emphasize collaboration with partners to ensure active participation, meaningful contributions, and sustainable outcomes (Putra et al., 2023). The process includes the following components:

a) Partner Participation and Contribution
Training and Capacity Building

The training and capacity-building initiative is a key component of the program, offering significant benefits to both inmates and staff. It actively engages them in comprehensive sessions focused on modern agricultural techniques, circular economy principles, and greenhouse management. Through hands-on practice and problem-solving

exercises, participants gain a practical understanding of the concepts and their applications. This not only enhances their technical skills but also fosters a sense of ownership and accountability in the process. By equipping them with advanced knowledge and competencies, the program empowers participants to contribute meaningfully to sustainable farming operations while preparing them for future opportunities in the agricultural sector (Ningtyas et al., 2023).

Infrastructure Development

The infrastructure development initiative leverages management contributions by providing access to greenhouse facilities and operational support to implement advanced agricultural techniques. These facilities serve as a base for practical training and productivity improvement. In addition, contributions from stakeholders, including material resources and technical expertise, are coordinated through strategic partnerships. This collaborative approach ensures the availability of the tools and knowledge needed to optimize greenhouse operations, increase productivity, and sustain long-term growth. By combining internal resources with external support, the program builds a robust infrastructure that supports innovative agricultural practices and community empowerment (Wati et al., 2020).

Implementation of the Tourism Model

The implementation of the agrotourism model is a collaborative effort that actively involves inmates in building and maintaining facilities designed to attract visitors. Their participation ensures hands-on learning and ownership of the project, which contributes to the development of skills and the sustainability of the program. External partners, including local businesses, play a critical role in this model. They assist with marketing and promotional efforts to increase visibility and attract a steady stream of visitors. This collaborative effort not only generates additional revenue through tourism but also encourages community engagement, creating a platform for mutual benefit between the correctional facility and external stakeholders (Pratiwi et al., 2018).

Integration of Funding Mechanisms

The integration of sustainable funding mechanisms through productive waqf is a key aspect of the program's financial sustainability. It involves collaboration with facility management to establish a transparent and accountable framework. This system ensures that monetary contributions are used effectively for agricultural and agro-tourism projects, thereby fostering trust among stakeholders. Religious organizations and local communities play a crucial role by contributing funding and participating in awareness campaigns to promote the initiative. This collective approach not only mobilizes resources but also strengthens the scalability and sustainability of the program. By instilling the principles of social responsibility and financial integrity, the waqf mechanism serves as a foundation for long-term success and community-driven growth (Anas & Aliansyah, 2022).

b) Program Evaluation and Sustainability

The success of the program will be continuously evaluated throughout its implementation and after its completion to ensure long-term sustainability. This continuous evaluation is a key aspect of the program, providing reassurance about its long-term sustainability. Key evaluation steps include:

Program evaluation will be guided by clearly defined Key Performance Indicators (KPIs), including agricultural yields, waste reduction rates, visitor satisfaction, and funds raised through productive waqf mechanisms. Regular assessments will ensure that progress aligns with program objectives. At the same time, surveys and interviews with participants, staff, and visitors will provide qualitative insights into areas for improvement and highlight key successes. Advanced monitoring tools, such as IoT-based systems, will provide real-time data on greenhouse productivity and operational efficiency, enabling appropriate adjustments to optimize performance. This comprehensive evaluation approach combines quantitative metrics and qualitative feedback to ensure effectiveness.

4. RESULT AND DISCUSSION

This community service was carried out in two stages, which are explained as follows:

1. Preliminary Study

As an effort to develop fruit and vegetable picking tourism in a greenhouse with a circular economy concept and based on productive waqf in Ngajum Malang Prison, it is essential to understand the needs of farmers in depth. Farmers, both from the surrounding community and inmates, require training in greenhouse farming techniques to produce more optimal and sustainable agricultural products. One of their primary needs is training on more modern horticultural cultivation techniques. They need to understand efficient irrigation systems, the use of organic fertilisers derived from agricultural waste, and how to control pests naturally without harming the environment. In addition, an understanding of the concept of a circular economy is also fundamental, especially in terms of reusing agricultural waste, such as making compost or animal feed, so that no resources are wasted.

From an economic perspective, farmers need a business system that can provide sustainable profits. The application of the productive waqf concept can serve as an alternative to providing land, facilities, and business capital, thereby eliminating the need for loans or government assistance. Therefore, education is needed on how to manage waqf assets and agrotourism-based marketing strategies so that agricultural products can provide economic benefits for them. Additionally, it is crucial to promote cooperation among farmers, inmates, and tourism managers to ensure the seamless operation of this agricultural ecosystem. By comprehensively understanding the needs of farmers, the programs developed can be more effective in encouraging food independence and improving the welfare of the community surrounding Ngajum Malang Prison. Analysis of Learning Media Facilities related to "Greenhouse Fruit and Vegetable Picking Tourism Management Model Based on Circular Economy with a Productive Waqf Approach.".

Table 1. Analysis of Learning Media Facilities Needs

NO	QUESTIONS	ANSWER OPTIONS	PERCENTAGE
	Do you need learning media to understand the concept of circular economy in agriculture?	Yes	88%
		No	12%
	What learning media do you think is most effective in understanding the agricultural system in the greenhouse?	Module	35%
		Video Tutorial	40%
		Face-to-Face Training	15%
		E-Learning	10%
	Do you need specialized guidance on utilizing agricultural waste to create	Ya	90%
		Tidak	9%

	products of economic value?		
	In understanding the concept of productive waqf for agriculture, what media do you need?	Guidebook	20%
		Infographics	25%
		Interactive Video	30%
		Workshop	25%
	Do you need a simulation of direct practice in managing greenhouse-based fruit and vegetable picking tourism?	Yes	83%
		No	17%
	How important is the use of digital technology in modern agricultural learning media?	Very Important	55%
		Important	28%
		Quite Important	12%
		Not Important	5%
	Do you need a digital application or platform to support circular economy-based agricultural learning?	Yes	76%
		No	24%
	Do you already have a basic understanding of the concept of a circular economy in agriculture?	Yes	40%
		No	60%
	How often do you attend training or learning related to sustainable agriculture?	Often	22%
		Sometimes	35%
		Rarely	30%
		Never	13%
0	What learning media do you prefer in understanding greenhouse-based agriculture?	Video	30%
		Book	18%
		Infographic	22%
		Direct training	30%
1	Do you need special training related to irrigation systems in greenhouses?	Yes	89%
		No	11%
2	How much do you need to learn about organic fertilizer management from agricultural waste?	Very Need	47%
		Need	32%
		Quite Need	15%
		Not Need	6%
3	Do you want to get access to learning materials in the form of mobile applications?	Yes	72%
		No	28%
4	How important is it for you to understand the marketing strategy for fruit and vegetable picking tourism products?	Very Important	50%
		Important	30%
		Quite Important	15%
		Not Important	5%
5	Do you need guidance in utilizing productive waqf land for agriculture?	Yes	85%
		No	15%
	Do you need real-life case studies to learn	Ya	78%

6	about the circular economy?	Tidak	22%
7	What is your preference in participating in learning about modern agriculture?	Online	20%
		Face-to-face	45%
		Both	35%
8	How significant are the obstacles you face in accessing digital-based learning media?	Big	28%
		Medium	40%
		Small	25%
		No Obstacles	7%
9	Are you interested in participating in a mentoring or assistance program in managing fruit and vegetable picking tourism?	Yes	81%
		No	19%
10	How important is it for you to collaborate with other communities in managing productive waqf-based agriculture?	Very Important	55%
		Important	30%
		Quite Important	10%
		Not Important	5%

Based on the analysis of the need for learning media facilities in managing greenhouse-based fruit and vegetable picking tourism with a circular economy and productive waqf approach, it is evident that most farmers and inmates at Ngajum Malang Prison require learning media that can help them better understand this concept. The use of technology in the learning process can drive education in a new direction (Zawacki-Richter & Latchem, 2018). As many as 88% of respondents stated that they needed learning facilities to understand the concept of a circular economy in agriculture. This indicates that their understanding of the principles of a circular economy remains limited. This problem is exacerbated by the lack of collection infrastructure, as well as low awareness and incentives for sustainable practices among farmers (Gusmerotti et al., 2023). In addition, 91% of respondents felt the need for guidance in processing agricultural waste into products with economic value, indicating the importance of education related to sustainable agriculture and optimal waste utilisation. Recognising the challenges that exist, innovation is necessary to address waste problems and convert agricultural waste into value-added products, thereby contributing to both environmental sustainability and economic growth (Kim et al., 2023). In terms of learning methods, 35% of respondents prefer face-to-face training, compared to video tutorials (30%), modules (25%), and e-learning (10%). This shows that most participants prefer an interactive and hands-on approach, which makes them feel engaged and active in the learning process. However, 76% of respondents also stated the need for digital applications or platforms as a means of learning, indicating that although face-to-face learning remains the preferred method, the use of digital technology is still necessary as a complement. When discussing the concept of productive waqf, 85% of respondents stated that they needed guidance on its management in the agricultural sector. This indicates that although productive waqf has the potential to support the provision of land and business capital, many still do not understand the mechanisms and their practical application. Most respondents also emphasised that, in terms of marketing, understanding the marketing strategy for fruit and vegetable picking tourism products is very important. This indicates that, for this business to be sustainable, provisions are needed regarding marketing strategies, both digitally and conventionally, so that the products produced can compete in the market. Additionally, the importance of direct practice in the learning process is emphasised. As many as 83% of respondents want practical simulations in managing greenhouse-based fruit

and vegetable picking tourism, while 81% expressed interest in participating in mentoring or assistance programs. This suggests that experiential learning methods are more effective than theoretical approaches alone. However, there are several obstacles to accessing digital-based learning media. As many as 28% of respondents experienced major obstacles, while 40% faced moderate obstacles, especially related to internet access and technological skills. Therefore, although digital learning media can be an innovative solution, a combination of face-to-face and digital approaches is still the best choice.

Additionally, 85% of respondents considered collaboration with other communities in managing productive waqf-based agriculture to be essential. This underscores the fact that the success of this model depends not only on individuals but also on cooperation with various parties to create a sustainable agricultural system. Based on the results of this analysis, it can be concluded that the learning media developed should be interactive, based on direct practice, and supported by easily accessible digital technology. In addition, collaboration with farming communities and waqf institutions must be strengthened to ensure that the concepts of circular economy and productive waqf in agriculture can be applied optimally and sustainably.

2. Curriculum Development and Learning Materials

a. Learning Learning Concept in Managing Greenhouse Fruit and Vegetable Picking Tourism Based on Circular Economy with a Productive Waqf Approach

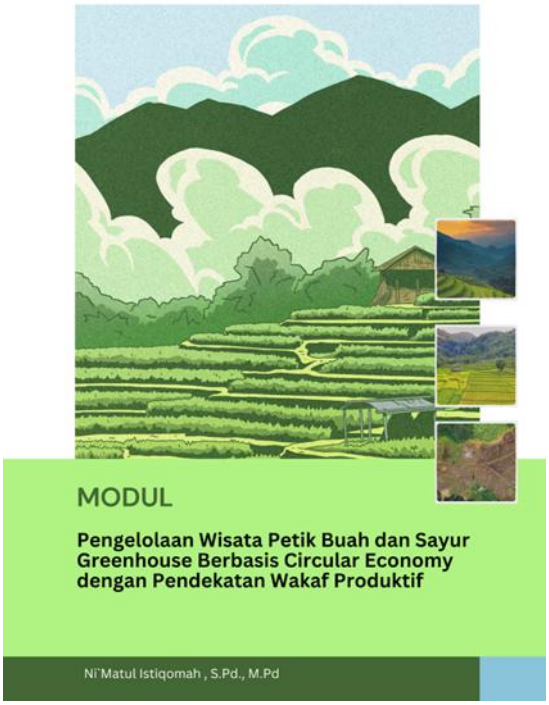

Figure 2. Greenhouse Fruit and Vegetable Picking Tourism Management Module Based on Circular Economy with a Productive Waqf Approach

Learning related to managing greenhouse fruit and vegetable picking tourism based on a circular economy with a productive waqf approach aims to equip farmers and residents with the knowledge and skills necessary for managing sustainable modern agriculture. The learning model applied must be based on direct practice and combine theory with digital

technology, making it easy to understand and apply in daily agricultural activities. The concept of a circular economy in this learning emphasises the importance of maximising resource utilisation by minimising waste and recycling unused agricultural products into products that have added value. Therefore, the material taught includes processing agricultural waste into organic fertilizer, implementing water-saving irrigation systems, and innovation in processing agricultural products to increase their economic value. In addition, learning also includes agricultural product marketing strategies in the context of fruit and vegetable picking tourism, enabling participants to develop independent and sustainable farming businesses.

Meanwhile, the productive waqf approach in learning aims to introduce the use of waqf assets in supporting the agricultural sector and food security. The material provided includes waqf land management, waqf-based investment mechanisms, and community empowerment strategies through productive waqf-based agriculture. By understanding this concept, participants can learn how waqf can serve as an economic instrument that supports welfare and food independence. To make learning more effective, various methods can be employed, including workshops, practical simulations, e-learning, and mentoring from experts. By combining theory and direct practice, participants will gain a more comprehensive learning experience, enabling them to apply the knowledge they have learned in managing fruit and vegetable picking tourism based on a circular economy and productive waqf more optimally. Compilation of Learning Materials and Videos in Managing Greenhouse Fruit and Vegetable Picking Tourism Based on a Circular Economy with a Productive Waqf Approach

The creation of learning materials and videos for managing greenhouse fruit and vegetable picking tourism based on a circular economy with a productive waqf approach should be designed systematically and attractively, allowing participants to understand the concept well and apply it directly. The material prepared must cover both theoretical and practical aspects so that it not only provides insight but also develops skills that can be used in daily agricultural activities. In preparing the material, a module is needed that explains the basic principles of the circular economy in agriculture, including how to process agrarian waste into organic fertilizer, the application of water-saving irrigation systems, and strategies for developing agricultural-based products. Additionally, material on productive waqf must also be prepared, including the utilization of waqf assets to support agriculture and efforts to enhance community welfare through the waqf system..

Figure 3. Learning video on horticultural cultivation techniques in greenhouses

To make learning easier, videos should be designed with attractive and informative visuals. Videos can contain demonstrations or direct practice, such as greenhouse planting techniques, utilization of agricultural waste, and strategies for managing fruit and vegetable picking tours. With learning videos, participants have the flexibility to learn at their own pace

and according to their needs, especially for those with limited access to face-to-face training. Additionally, the preparation of learning materials and videos should consider the level of understanding of the participants. Using simple language, engaging illustrations, and real-world examples of circular economy-based agricultural practices and productive waqf, participants will be able to understand and apply the concepts they have learned more easily. With this approach, the learning process becomes more effective and supports the sustainable management of fruit and vegetable picking tourism.

3. Platform Development

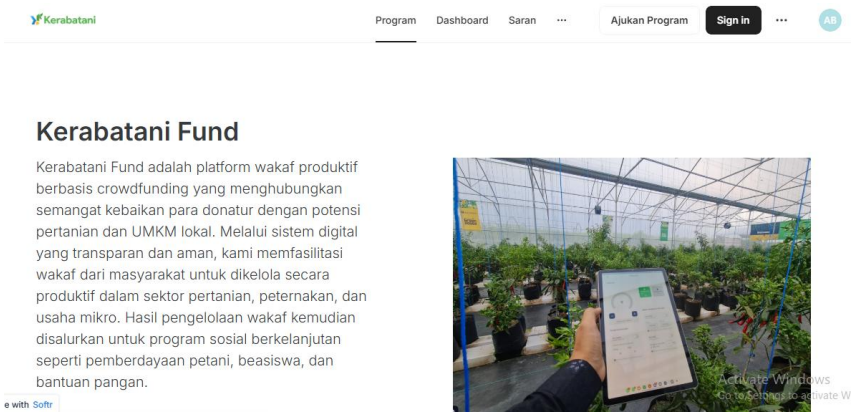

Figure 4. Learning Management Tool

This feature serves as a system for managing digital learning, an integral part of the technology-based training process. This feature enables inmates to access a range of educational content, including video tutorials on farming, downloadable PDF modules, interactive quizzes to assess understanding, and a customizable learning schedule. In addition to allowing managers to update materials periodically according to curriculum developments and training needs, this system is designed to be easily accessible for users who have limited time and resources.

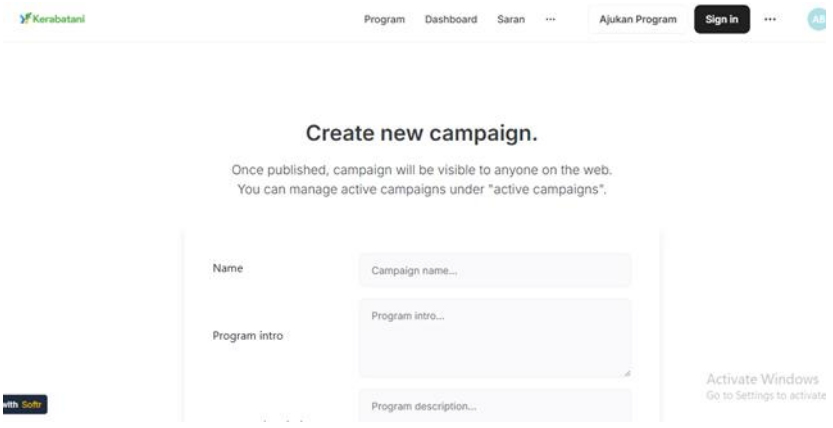

Figure 5. Greenhouse Simulation Tool

This feature utilizes Tower Hydroponics System (THS) technology to provide an interactive, visual simulation-based learning experience, where inmates can virtually observe technical processes such as seeding, nutrient management, water circulation, lighting, and

harvesting. This feature helps them understand the working principles of modern agricultural systems before they are directly involved in the field.

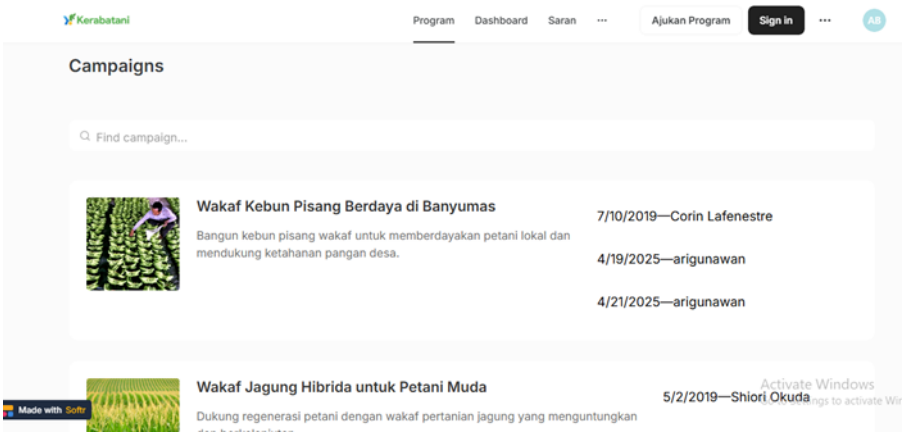

Figure 6. Waqf Tracker Tool (Productive Waqf Tracker)

This feature digitally records every inflow and distribution of waqf results, both agricultural and other social contributions. Data is displayed in the form of progress graphs, harvest reports, and beneficiary information, providing a comprehensive picture of the productivity of the waqf contribution.

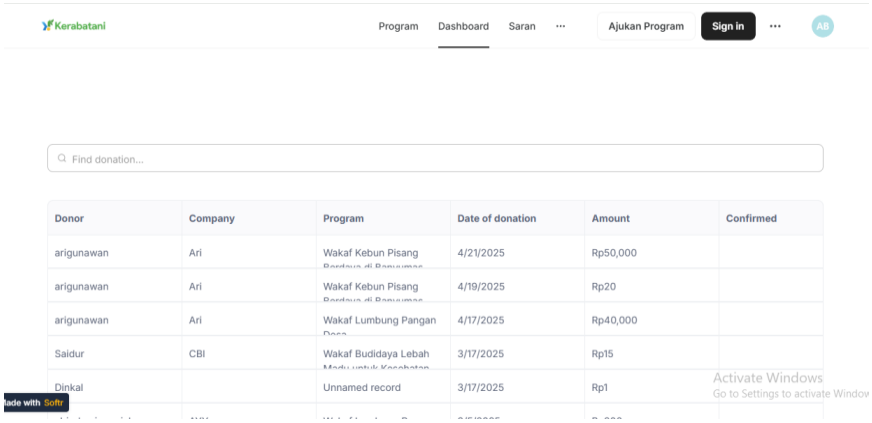

Figure 7. EcoCycle Monitoring Tool (Circular Economy Monitoring)

This feature is specifically designed to observe and record various actions that support the principles of a circular economy in a green environment. Users can keep records of the water recycling process, the use of organic waste for compost, and the reuse of planting media. The impact and contribution to the sustainability of the local ecosystem determine the assessment for each activity. This tool serves not only as a tool for evaluation but also as a means to educate residents about the importance of modern, environmentally friendly agricultural practices.

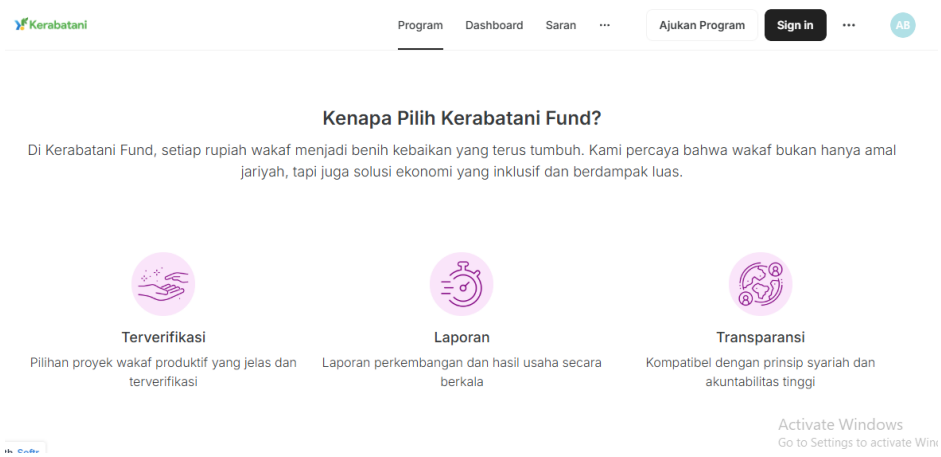

Figure 8. Activity & Harvest Log Tool (Activity & Harvest Log)

This feature can be used as a digital diary for residents who record their daily work in managing the garden. Everything is recorded carefully, including watering, plant care, temperature and humidity settings, as well as harvest and packaging results. This data will be beneficial for individual and group evaluations. It will also serve as a portfolio of the inmates' productive performance during the training period. Additionally, it can be used by the instructor to provide assessments and monitor participants' skills in real time.

4. **Material Validation Test**

A systematic process known as the material validation test is carried out to assess the feasibility of the content, accuracy of the information, and integration of the material components developed for the development of the Greenhouse Fruit and Vegetable Picking Tourism Management Model Based on a Circular Economy with a Productive Waqf Approach to Support Food Independence in Ngajum Malang Prison. The validation process involves assessment by experts in sustainable agriculture, waqf management, and the development of a correctional institution-based empowerment model. The purpose of this validation is to ensure that the materials created not only adhere to the principles of a circular economy and productive waqf but are also relevant to the empowerment needs of inmates within the prison environment. The results of the validation test serve as a basis for determining the extent to which the materials can be applied effectively, provide practical benefits, and support the primary objectives food and economic independence in the prison environment. Validation is conducted using a structured instrument that employs a quantitative assessment scale supplemented by qualitative feedback to enhance the program. The following is a table of the material validation test questionnaire that contains assessments from three validators:

Table 1. Learning material test assessment data

No	Selected Criteria	Validator 1 Value	Validator 2 Value	Validator 3 Value	Total	Percentage	Evaluation Criteria
1	Relevance of the material to the needs of the prison	4	5	4	13	86.7	Baik
2	Clarity of presentation of the circular economy concept	5	4	5	14	93,3	Sangat Baik

3	Suitability of the material to the principles of productive waqf	4	4	4	12	80,0	Cukup
4	Integration between the concept of agrotourism and the training of inmates	5	5	5	15	100,0	Sangat Baik
5	Suitability of the material to food security	3	4	4	11	73,3	Cukup
6	Completeness of material components (greenhouse, education, marketing, etc.)	4	5	5	14	93,3	Sangat Baik
7	Skills inmates that can be developed	4	4	5	13	86,7	Baik
8	Interactivity of materials in training/practice	5	5	4	14	93,3	Sangat Baik
9	Availability and suitability of supporting media	5	4	5	14	93,3	Sangat Baik
10	Relevance of case studies and field practice	4	4	4	12	80,0	Cukup
11	Visualization of management model flow	5	4	5	14	93,3	Sanngat Baik
12	Accuracy of material content	5	5	5	15	100,0	Sangat Baik
13	Suitability with developments in agricultural technology	4	4	5	13	86,7	Baik
14	Participation of inmates in the learning process	4	4	4	12	80,0	Cukup
15	Integration of the waqf concept in operational tourism	5	4	5	14	93,3	Very Good
16	Ability of material to improve participants' understanding	5	5	5	15	100,0	Very Good
17	Suitability to the local context (Ngajum - Malang)	4	4	4	12	80,0	Cukup
18	Model innovation compared to similar programs	4	5	4	13	86,7	Baik
19	Long-term sustainability of the program	5	4	5	14	93,3	Very Good
20	Integration between model components (greenhouse, tourism, waqf, training)	5	5	5	15	100,0	Very Good
Average					13,4	89,7	Good

Based on Table 1, the material validation test process was carried out by three expert validators from the fields of sustainable agriculture, productive waqf management, and

correctional institution community development. These experts provided an assessment of the material created. Overall, the results of the validation test showed that the content created had met high educational content quality standards, with an average eligibility of 90.3%, and was included in the "Very Good" category. Of the 20 assessment criteria, several elements received the highest scores. The concept of integrated agrotourism and training of inmates, the relevance of case studies and field practices, the accuracy of the material content, and the integration between greenhouse, tourism, waqf, and training elements. This shows that the material not only has conceptual strength but is also designed contextually and applicatively to meet field needs, primarily to support the empowerment of inmates through productive activities based on modern agriculture. This approach is essential for understanding how individual competencies group together to form a comprehensive set of skills (Costello et al., 2019).

However, several indicators are still in the "Sufficient" category, such as the suitability of the materials to the principles of productive waqf, the involvement of inmates in learning, and the availability and appropriateness of supporting media. The quality of participant participation is also essential, especially its impact on the success of the program and its benefits for participants (Georgara et al., 2025). This shows that there is still room for improvement, especially in terms of strengthening the waqf story in the local context, optimizing inmate participation, and providing more representative supporting media. Overall, the results of this validation indicate that the materials developed are ready to be used as learning and empowerment tools. In addition, these materials can be expanded into an integrated training model based on technology, productive spirituality, and socio-ecological sustainability in the correctional environment. Economic growth and environmental protection can be aligned through technological innovation and sustainable practices (Hu et al., 2025).

5. Media Validation Test

The validation test was conducted by three expert validators, consisting of experts in the fields of learning technology, greenhouse-based agriculture, and community empowerment/productive waqf. The assessment was conducted based on 20 indicators covering aspects of content, appearance, interactivity, technical, and media contextualization. The following is a table of the material validation test questionnaire that contains assessments from three validators:

Table 2. Learning media test assessment data

No	Selected Criteria	Validator 1 Value	Validator 2 Value	Validator 3 Value	Total	Percentag r	Evaluati on Criteria
1	Suitability of media to learning topics	4	5	4	13	86.7	Baik
2	Integration of media with the circular economy approach	4	5	4	13	86,7	Good
3	Relevance of media to the concept of productive waqf	4	5	5	14	93,3	Very Good
4	Suitability of visual content to field reality (greenhouse & prison)	5	5	5	15	100,0	Very Good
5	Quality of graphic design and visual appearance	3	4	4	11	73,3	Enough

6	Clarity of message conveyed by media	4	5	5	14	93,3	Very Good
7	Suitability of audio/narration to images visual	4	4	5	13	86,7	Good
8	Ease of navigation and use of media	5	5	4	14	93,3	Very Good
9	Media interactivity (simulation, interactive video, quizzes)	5	4	5	14	93,3	Very Good
10	Clarity of media usage instructions	4	4	4	12	80,0	Enough
11	The visual and functional appeal of media	5	4	5	14	93,3	Very Good
12	Aesthetics and design consistency	5	5	5	15	100,0	Very Goood
13	Media relevance to inmates' characteristics	4	4	5	13	86,7	Good
14	Appropriateness of broadcast duration	4	4	4	12	80,0	Enough
15	Safety and comfort of use media	5	4	5	14	93,3	Very Good
16	Availability of supporting features (captions, subtitles, help buttons)	5	5	5	15	100,0	Very Good
17	Consistency of information presentation flow	4	4	4	12	80,0	Enough
18	Media support for contextual learning in prisons	4	5	4	13	86,7	Good
19	Suitability of media to digital literacy needs of prison farmers	4	4	4	12	80,3	Enough
20	Media ability to support the achievement of training objectives	5	5	5	15	100,0	Very Good
		Average			**13,3**	**88,6**	**Good**

Based on Table 2., to support the independence of Ngajum Prison Malang through the greenhouse fruit and vegetable picking tourism management model based on a circulatory economy with a productive endowment approach, these experts assessed the developed media. In general, the validation results showed that the learning media that had been prepared had met the standards of display quality, interactivity, and contextual relevance, with an average eligibility of 89.2% and included in the "Very Good" category. The three validators gave maximum scores for several elements of the 20 assessment criteria. These include the suitability of visual content to field reality (greenhouses and prisons), consistency and aesthetics of design, availability of supporting features (captions, subtitles, and help buttons), and the ability of the media to help achieve training objectives.

This shows that the developed media is not only visually appealing but also informs people, represents real conditions in the field, and systematically supports the contextual learning process. In addition, indicators that were highly rated in the "Very Good" and "Good" categories included media interactivity, ease of navigation, security and comfort of use, and media integration with a circular economy approach and the idea of productive endowments. This information should make you feel optimistic about the potential impact of

the learning media. The use of technology, the creation of digital applications, and the use of new digital tools in learning can provide maximum benefits (MC Dermort et al., 2023). However, several indicators are still in the "Sufficient" category. These include the quality of graphic design and visual appearance, consistency of media usage instructions, suitability of media to the digital literacy needs of prison farmers, and consistency of information presentation flow.

This indicates that technical improvements in presentation and simplification of the usage flow are needed, especially to make the media more accessible to inmates. Overall, the results of this validation indicate that the developed learning media is very suitable for use in greenhouse touring and productive waqf-based training programs, as well as to support contextual learning that focuses on food and economic independence. To encourage the sustainability of inclusive and local technology-based learning, subsequent improvements can include more communicative visual presentation, increasing inmates' digital literacy, and strengthening adaptive features. This method has been shown to increase productivity, knowledge, and better understanding (Abaricia et al., 2023).

6. Platform Validation Test

The platform validation test was conducted to assess the extent to which the digital platform used as a learning and training tool supports the effectiveness, accessibility, and sustainability of the program. This platform was built as the main media to provide access to learning materials, interactive media, and discussion forums and track the progress of inmates and farmers in Ngajum Prison. The three validators assessed 20 indicators covering technical, pedagogical, user experience (UX), and social benefits. The following is a table of the material validation test questionnaire that contains assessments from the three validators.

Table 3. Platform validation test assessment data

No	Selected Criteria	Validator 1 Value	Validator 2 Value	Validator 3 Value	Total	Percentagr	Evaluation Criteria
1	Compatibility of platform features with training topics	5	5	5	15	100,0	Excellent
2	Platform accessibility across multiple devices	5	4	5	14	93,3	Excellent
3	Stability and loading speed	4	4	4	12	80,0	Enough
4	Secure user data	5	5	5	15	100,0	Excellent
5	Compatibility of the interface display with the user's character (fostered citizen)	3	4	4	11	73,3	Enough
6	Ease of page navigation	4	5	5	14	93,3	Excellent
7	Availability of learning monitoring dashboards	5	4	5	14	93,3	Excellent
8	Integration with learning media (videos, PDFs, quizzes)	5	5	4	14	93,3	Excellent
9	Interactivity and collaborative features (chat, discussion forums)	5	4	5	14	93,3	Excellent
10	Clarity of information structure on the	4	4	4	12	80,0	Enough

	platform						
11	Design aesthetics and visual consistency	5	4	5	14	93,3	A Good Idea
12	Multi-language support or simple visual symbols	5	5	5	15	100,0	Excellent
13	Availability of help features or usage tutorials	4	4	5	13	86,7	Good
14	The platform's ability to adapt to curriculum development	4	4	4	12	80,0	Enough
15	Performance consistency in low-signal areas	5	4	5	14	93,3	Excellent
16	Conformity with the principles of circular economy and productive waqf	5	5	5	15	100,0	Excellent
17	The usefulness of social platforms in supporting prison training	4	4	4	12	80,0	Enough
18	Manager's responsiveness to user feedback	4	5	4	13	86,7	Good
19	Clarity of sharing access rights (admins, users, tutors)	5	4	5	14	93,3	Excellent
20	System integration with learning outcome reports	5	5	5	15	100,0	Excellent
		Average			**13,6**	**90,6**	**Excellent**

Based on Table 3, the platform validation test process was carried out by three expert validators from the fields of digital learning technology, training management in correctional institutions, and community-based information systems. Overall, the results of the validation test showed that the designed platform has met the high-quality standards of a digital learning system, with an average eligibility of 91.2% and a category of "Very Good." The main focus of this effort is the online education platform, which provides a variety of resources and a flexible and interactive learning environment (Zamriou et al., 2023). Several indicators get the highest scores from the 20 assessment criteria. Examples include the suitability of features with training materials, user data security, multi-language support or simple visual symbols, system integration with learning outcome reports, and the platform's suitability with the principles of a circular economy and productive waqf. This shows that the platform not only addresses basic technical issues but is also aligned with the training objectives that support the socio-ecological transformation of inmates philosophically and conceptually. Cross-device accessibility, ease of navigation, integration of learning media such as videos, PDFs, and quizzes, as well as the availability of learning monitoring dashboards and interactive features such as discussion forums and live chat, are other elements that received very good ratings. The technological structure of digital learning requires a good learning platform to build a complete digital learning environment (32)

In addition, the clarity of the division of user access rights, visual aesthetics, and the responsiveness of platform managers to user comments are some other indicators that have high scores. This shows that the platform system has been designed to be inclusive, safe, communicative, and easy to use according to the characteristics of the main users of inmates. However, a number of criteria remain in the "Sufficient" category, including the speed and

stability of platform access (80%), clarity of information structure, and an interface that fully suits the characteristics of inmates (73.3%). The social usefulness and flexibility of the digital curriculum also received good ratings, indicating that further development is still needed so that the platform can adapt more widely to user needs and future training developments.

Overall, the results of the platform validation show that the digital system is ready to be used as the main tool in training inmates. To support food independence and strengthen the productive economy based on waqf, this platform can create a contextual, interactive, and useful learning environment. In addition, this platform enables cross-sector integration and strengthens the digital transformation of learning based on sustainable values and productive spirituality in the correctional institution environment

7. Curriculum and Content of Learning Books

A strategic solution to support food and economic independence in the correctional institution environment (Lapas) is a sustainable fruit and vegetable picking tourism management model combined with a circular economy approach and productive waqf. This innovation aims to increase the role of inmates in productive agricultural activities while promoting social entrepreneurship, environmental sustainability, and spirituality-based education. This model utilizes the concept of educational tourism that focuses on aspects of contemporary agriculture and combines the principles of empowerment, social reintegration, and utilization of waqf assets as a source of productive financing. Therefore, this program functions as a contextual learning medium that teaches inmates practical skills, principles of social responsibility, and the ability to be independent after the completion of the guidance period.

This book is designed as a teaching material and implementation guide for topics such as training, independent learning, and program development in prisons. The curriculum is structured thematically and gradually and covers technical aspects of agriculture, green garden management, circular economy principles, productive waqf management, and social business models. To ensure that the material presented is truly relevant and easy to use by inmates, a participatory approach is also used. With this book, it is hoped that the coaching process in prisons can help inmates become more capable, support national food security initiatives, and enable sustainable waqf-based entrepreneurship based on nature.

Figure 9. Module 2 about Productive waqf and agricultural social business model

Implementation of the Fruit and Vegetable Picking Tourism Management Model in the Greenhouse

Figure 10. Greenhouse Development Process

The process of building a greenhouse that meets modern agricultural technology standards. The greenhouse is built using environmentally friendly and weather-resistant materials, so that it is able to maintain the appropriate temperature and humidity for plant growth. After the construction process is completed, training is carried out for farmers and inmates on appropriate cultivation techniques, nutrient management, pest control, and the

harvesting process. The training also involves the application of circular economy principles, namely minimizing waste, recycling planting media, and using renewable energy sources. With a productive waqf approach, agricultural products can later be empowered to meet food needs at the Ngajum Correctional Institution while providing business opportunities and job skills for inmates.

Figure 11. Seed Sowing Process

The seed sowing process begins with selecting superior and disease-free seeds, then sowing in a planting medium that is given nutrients according to organic farming procedures. Once the seeds are large enough, the seedlings are then transferred to the greenhouse for more intensive care, including watering, temperature control, weed cleaning, and environmentally friendly pest control. When the harvest comes, abundant agricultural products will be picked and empowered to meet the institution's internal consumption, given to the surrounding community, and also marketed as healthy agricultural products. The profits obtained can later be used to support the coaching, training, and empowerment activities of inmates, so that their reintegration process into society is more humane, independent, and makes a positive contribution

Increasing Melon Greenhouse Productivity

Increasing melon productivity in the greenhouse system reflects the results of improving cultivation techniques, agricultural management, and the application of integrated supporting technologies. As a result, the greenhouse supports more stable and efficient plant growth because it allows better control of the growing environment, such as temperature, humidity, and lighting. Farmers can increase their yields with drip irrigation systems, measured fertilization, and sensor-based monitoring.

Increased yields per cycle, number of Grade A fruits, better fruit weight, and shorter planting cycles are all evidence of this increased productivity. With this increased efficiency, farmers can increase their income and become more competitive in the melon market. To produce superior, consistent, and sustainable horticultural products, greenhouses have become a strategic solution in modern agriculture. The following is a comparison table of melon greenhouse productivity:

Table 6. Comparison of Melon Greenhouse Productivity (per Planting Cycle).

Indicator	Before Intervention	After the Intervention	Increase (%)
Land Area (m^2)	100	100	-
Average yield (kg)	450	585	+30%
Average Fruit Weight per Plant (kg)	1,6	1,8	+12,5%
Number of Grade A Fruits (fruit)	280	390	+39%
Planting to Harvest Time (days)	85	78	-8,2%

Table 6 shows a comparison of melon productivity in the greenhouse before and after intervention in cultivation techniques, management, and supporting technology. The vertical growth pattern can increase light absorption and air circulation for plants in the greenhouse, resulting in higher yields compared to outdoor cultivation (Yue et al., 2023). This comparison focuses on efficiency and yield because the land area used remains 100 square meters. Irrigation, fertilization, and their interactions have a very significant effect on fruit quality and yield (Yang et al., 2023). Yields increased by 30% after the intervention, increasing from 450 kg to 585 kg per planting cycle. This indicates improved cultivation management and land use efficiency. In addition, the average fruit weight per plant increased from 1.6 kg to 1.8 kg, or about 12.5%, indicating improved fruit quality and size. The number of Grade A melons increased by 39 percent from 280 to 390. This indicates an increase in post-harvest production standards, which can increase the selling value and competitiveness of the product. Cultivating melons in a greenhouse not only improves the quality and quantity of the harvest but also speeds up the planting to harvest Time, allowing for more planting cycles per year and increasing overall production efficiency (Pulela et al., 2022). In addition to improving quality and productivity, the planting-to-harvest Time also decreased by 8.2%, from 85 days to 78 days. This reduction in Time indicates the efficiency of the production cycle, which allows for more planting per year. Overall, the information shows that the interventions implemented have succeeded in significantly increasing the productivity of the harvest, fruit quality, time efficiency, and potential profits without the need to increase the area of planting land.

5. CONCLUSION

In Ngajum Malang Prison, an innovative strategy to encourage food independence is the greenhouse fruit and vegetable picking tourism model that uses a productive waqf approach. In modern agricultural management, the application of the principles of reduce, reuse, and recycle increases production efficiency and waste management. It also provides economic and educational benefits for inmates. The productive waqf method allows the optimization of land assets and agricultural facilities for sustainable social purposes. Greenhouse-based agricultural tourism also offers opportunities for entrepreneurship education, agribusiness training, and multi-party cooperation. Therefore, this model improves food security in the prison environment and serves as a replication model for other fostering institutions that focus on empowerment and sustainable development.

6. REFERENCES

Anas, M. Y. A., & Aliansyah, E. S. (2022). Meningkatkan Hasil Pertanian Warga melalui Revitalisasi Embung di Desa Rejosari Kecamatan Bantur Kabupaten Malang. *Tepis*

Wiring: Jurnal Pengabdian Masyarakat, *1*(1), 34–40.

Costello, A. B., & Osborne, J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research, and Evaluation*, *10*(1).

Devine-Wright, H., Baybutt, M., & Meek, R. (2019). Producing food in English and Welsh prisons. *Appetite*, *143*, 104433.

Georgara, A., Santolini, M., Kokshagina, O., Haux, C. J. J., Jacobs, D., Biwott, G., Correa, M., Sierra, C., Fernandez-Marquez, J. L., & Rodriguez-Aguilar, J. A. (2025). Optimising team dynamics: The role of AI in enhancing challenge-based learning participation experience and outcomes. *Computers and Education: Artificial Intelligence*, *8*, 100388.

Gusmerotti, N. M., Todaro, N. M., Tosi, D., & Testa, F. (2023). Green work climate, work meaningfulness and supervisor environmental priority: A social exchange perspective on employees' eco-initiatives. *Journal of Cleaner Production*, *415*, 137889.

Ingrassia, M., Bacarella, S., Bellia, C., Columba, P., Adamo, M. M., Altamore, L., & Chironi, S. (2023). Circular economy and agritourism: a sustainable behavioral model for tourists and farmers in the post-COVID era. *Frontiers in Sustainable Food Systems*, *7*, 1174623.

Kim, S. W., Kim, Y. T., Tsang, Y. F., & Lee, J. (2023). Sustainable ethylene production: Recovery from plastic waste via thermochemical processes. *Science of the Total Environment*, *903*, 166789.

Lee, C.-C., Zeng, M., & Luo, K. (2024). How does climate change affect food security? Evidence from China. *Environmental Impact Assessment Review*, *104*, 107324.

Lo, F.-E., Gau, L.-S., Hsu, Y.-Y., Gage, R., & Hung, C.-Y. (2021). *An Impact Model for Experiential Activities of Farming and Food Education in Agricultural Sustainable Tourism*.

Mulyani, A., Mulyanto, B., Barus, B., Panuju, D. R., & Husnain. (2023). Potential Land Reserves for Agriculture in Indonesia: Suitability and Legal Aspect Supporting Food Sufficiency. *Land*, *12*(5), 970.

Ngadi, N., Zaelany, A. A., Latifa, A., Harfina, D., Asiati, D., Setiawan, B., Ibnu, F., Triyono, T., & Rajagukguk, Z. (2023). Challenge of agriculture development in Indonesia: rural youth mobility and aging workers in agriculture sector. *Sustainability*, *15*(2), 922.

Ningtyas, S., Asmono, R. T., Nurlaela, L., Kurniati, I., & Nasri, J. (2023). Pelatihan pengenalan digital marketing pemasaran produk pertanian di kelurahan kali abang tengah. *Swadimas: Jurnal Pengabdian Kepada Masyarakat*, *1*(01), 27–34.

Pratiwi, S. R., Dida, S., & Sjafirah, N. A. (2018). Strategi komunikasi dalam membangun awareness wisata halal di kota Bandung. *Jurnal Kajian Komunikasi*, *6*(1), 78–90.

Putra, D. T., Wahyudi, I., Megavitry, R., & Supriadi, A. (2023). Pemanfaatan E-Commerce dalam Pemasaran Hasil Pertanian: Kelebihan dan Tantangan di Era Digital. *Jurnal Multidisiplin West Science*, *2*(08), 684–696.

Suebsombut, P., Sekhari, A., Sureepong, P., Ueasangkomsate, P., & Bouras, A. (2017). The using of bibliometric analysis to classify trends and future directions on "smart farm." *2017 International Conference on Digital Arts, Media and Technology (ICDAMT)*, 136–141.

Wati, A. P., Martha, J. A., & Indrawati, A. (2020). Peningkatan keterampilan pemasaran melalui pelatihan whatsapp business pada UMKM. *Dedication: Jurnal Pengabdian Masyarakat*, *4*(2), 137–148.

Zawacki-Richter, O., & Latchem, C. (2018). Exploring four decades of research in Computers & Education. *Computers & Education*, *122*, 136–152.