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Application of Optimization Theory in Planning the Use of Idle Land for Agriculture

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Abstract: This study aims to apply optimization theory in planning the use of idle land for agriculture to improve efficiency and farmers' income. This study was motivated by the existence of underutilized idle land and limited agricultural resources, which often result in inefficient land use and suboptimal income for local farmers. A case study was conducted on a 1,000 m² plot of idle land in Highland Park Housing, Kota Serang Baru, Serang, Banten, using a quantitative approach and Linear Programming (LP) analysis. Primary data were collected through interviews and field observations, while secondary data were obtained from the literature and relevant sources. The results showed that cucumbers and small chili contributed the most to income, with optimal land allocations of 900 m² and 100 m², respectively. Chili pepper and eggplant were not economically feasible for cultivate under the current conditions because of their low profitability. By applying LP through Excel Solver, the maximum income obtained was Rp71,600,000. Chilli pepper cultivation is recommended based on simple analysis and linear programming due to its significant and optimal profits. The study concludes that optimization theory provides an effective approach for the sustainable planning of idle land use in agriculture.

Keywords: Linear Programming, Idle Land Optimization, Agricultural Land Use, Farm Income Maximization, Sustainable Agriculture Planning

1. Introduction

Planning the use of idle land for agriculture is one strategic solution to addressing the challenge of rising food demand in tandem with population growth. Idle land, which is often neglected or underutilized, holds great potential to be managed as a productive agricultural resource. According to Priyantoro et al. (2024), the utilization of idle land has a significant impact on regional and agricultural development. Selecting the right locations to utilize idle land can increase agricultural productivity, reduce losses due to soil erosion, and support environmental sustainability. The limited availability of agricultural land in urban areas due to urbanization poses a challenge in raising awareness of food security among households. Indeed, at the national level, the challenge of building food security in Indonesia is the limited availability of agricultural land. Land scarcity, particularly the conversion of rice fields, can pose a threat to food security due to the reduction in national food production capacity, such as vacant land in residential areas (Muttaqin et al., 2018). In Indonesia, idle land is scattered across various regions, including in residential areas that have many unused lands.

Highland Park residential area in Serang Baru, Serang, Banten can be an example, which has several plots of idle land, some of which have been managed by local farmers for urban farming activities. The utilization of idle land within residential areas can be one solution to increase food availability at the household and local community levels. Through integrated management, idle land can be planted with various food crops, as well as useful plants such as medicinal plants and vegetables. One of the efforts undertaken by the government to achieve community food security is the empowerment of local potential through the concept of utilizing marginal land and backyards in both rural and urban areas (Amalia, 2024). However, the management of such idle land has not yet been based on a systematic and measurable approach, making it necessary to apply optimization theory to plan land use more efficiently and sustainably.

Optimization theory is a mathematical approach used to determine the best solution from a range of alternatives by considering specific objectives and existing constraints. This approach emphasizes the identification of maximum or minimum values of an objective function through a systematic decision-making process (Diadi and Astuti, 2024). In the context of land-use planning, optimization can support the determination of suitable cropping patterns, efficient resource allocation, and management strategies aimed at increasing agricultural productivity while reducing negative environmental impacts. In addition, optimization techniques have been widely implemented in land-use planning because they are capable of balancing economic benefits, productivity improvement, and environmental sustainability (Rodrigues et al., 2021). Memmah et al. (2018) further explained that multi-criteria optimization approaches can assist decision-making in agricultural land allocation by considering interconnected aspects such as economic returns, agricultural productivity, and environmental conservation simultaneously. Therefore, the application of optimization theory is expected to make a meaningful contribution to improving the productivity and utilization of idle land in the Highland Park residential area.

Previous studies have addressed the utilization of idle land for agriculture, but these have been limited to conventional approaches that do not incorporate optimization theory. For example, a study by Wahyono et al. (2017) examined the economic prospects of policies aimed at utilizing idle land productivity for the cultivation of porang and oyster mushrooms in East Java, but did not include optimization analysis in its planning. Another study by Rumagit and Memah (2018) explored the utilization of idle land to improve agricultural enterprises in Walian Satu Village, Tomohon City, but its focus was more on the aspects of farm business analysis rather than a technical-optimization approach. Research conducted by Sembiring (2023) shows that the utilization of fallow land by farmer groups can provide additional income for farmers, thereby contributing to an improvement in their standard of living. The results of the farm income analysis indicate that farmers derive economic benefits from cultivating various commodities, such as chili peppers, galangal, mustard greens, and other horticultural crops. In addition to providing economic benefits, the Farmers' Group in Pulo Brayan Bengkel Baru Village also plays a role in motivating the surrounding community to utilize unmanaged land to turn it into productive agricultural land; however, as with other studies, this research has not yet included optimization calculations for the utilization of fallow land.

Given these conditions, there is a research gap in the limited application of optimization theory in planning the use of fallow land for the agricultural sector, particularly at the scale of residential areas involving real-world field conditions. Therefore, this study aims to examine the application of optimization theory in planning the use of fallow land for agriculture in the Highland Park Housing Complex, Serang Baru City. This location was chosen because it has a sufficiently large area of fallow land that has been utilized by local farmers, thus providing an opportunity to test the effectiveness of the optimization approach in a real-world context. The results of this study are expected to provide concrete recommendations for farmers and stakeholders on how to manage fallow land more efficiently and sustainably. In addition, this study is also expected to serve as a reference for the development of optimization-based agricultural policies in other regions of Indonesia.

2. Methodology

2.1 Research Method

This study was conducted on idle land located in the Highland Park residential area, Kota Serang Baru , Banten Province, Indonesia. The research was carried out over a three-month period, from October to December 2024, and included the preparation, data collection, data processing, analysis, and report writing phases. This study employed a case study approach with a quantitative framework using Linear Programming (LP) analysis. This approach was chosen to determine the most optimal strategy for allocating agricultural land use in order to maximize farmers' income from the utilization of 1,000 m² of idle land.

The data used are primary and secondary data. Primary data were obtained through direct field surveys and structured interviews with farmers who manage idle land at the research site. The data collected include: the area of land used for cultivation, the types of crops cultivated, production costs, including seeds, fertilizers, pesticides, and labor, harvest yields, selling prices of agricultural products, and farmers' income obtained from land use. Secondary data were collected from scientific literature, government reports, previous research articles, and other relevant references related to the optimization of idle land and the application of Linear Programming in agriculture.

Respondents were selected using a purposive sampling method. The selected respondent was a farmer actively managing 1,000 m² of idle land in the Highland Park housing complex. Respondents were selected based on the following criteria: having experience cultivating idle land for agricultural purposes, actively carrying out agricultural activities during the research period, and being willing to participate and provide the information needed for the research. The respondent selection process was carried out after conducting preliminary observations and consultations with local parties familiar with agricultural activities in the study area.

Data collection is carried out in several stages, as follows: Field Observation: Direct observation is carried out to check land conditions, cultivated crops, and agricultural practices implemented by farmers. Structured Interviews: Interviews were conducted using a structured questionnaire designed to obtain detailed information on production costs, harvest yields, selling prices, labor utilization, and farmer income. Supporting Documentation: Supporting documents including production records, photographs of farming activities, and other relevant supporting data, were collected to strengthen the research findings.

2.2 Data Analysis Procedure

Data analysis was performed using the Linear Programming (LP) approach with the assistance of Microsoft Excel Solver. The analytical procedure was conducted systematically through the following stages:

2.2.1 Identification of Decision Variables

The first stage involved determining the decision variables to be optimized, namely the allocation of land area for each cultivated crop commodity.

For example:

X_1 = land area allocated to crop commodity 1 (m²)

X_2 = land area allocated to crop commodity 2 (m²)

2.2.2 Formulation of the Objective Function

The objective function was formulated to maximize farmers' income based on the profit generated from each crop commodity. General form of the objective function :

$$\text{Maximize } Z = c_1X_1 + c_2X_2 + \cdots + c_nX_n$$

Where:

- Z = maximum total income,
- c = profit per unit area of each crop commodity,
- X = land allocation for each commodity.

2.2.3 Determination of Constraints

Several constraints were incorporated into the model, including:

- land availability,
- production cost limitations,
- labor availability, and
- other production input constraints.

Example of land availability constraint:

$$X_1 + X_2 \leq 1000$$

2.2.4 Preparation of Input Data

All data related to production costs, crop yields, selling prices, labor requirements, and profits for each commodity were organized into Microsoft Excel worksheets as the basis for the LP model formulation.

2.2.5 Optimization Process Using Excel Solver

The optimization process was carried out using Microsoft Excel Solver with the Linear Programming approach. The formulated objective function and all identified constraints were incorporated into the model to obtain the optimal solution for land allocation. The Simplex LP method was applied to identify the combination of crop commodities capable of generating the maximum possible income under the existing resource limitations, including land availability, production costs, and labor capacity.

2.2.6 Interpretation of Results

The optimization results were subsequently analyzed to evaluate the most efficient land allocation pattern for the utilization of idle land. The analysis focused on identifying the maximum potential income that could be achieved by the farmer, assessing the efficiency of resource utilization, and examining the constraints that had the greatest influence on the optimization model. The findings were then used as the basis for formulating recommendations regarding more efficient and sustainable management strategies for idle agricultural land.

Research Limitations

This study has several limitations. First, the research focused on only one farmer managing 1,000 m² of land. Second, the analysis primarily emphasized economic aspects, particularly production costs and income, without extensively examining environmental and social dimensions. Third, the data used in this study were cross-sectional in nature and therefore could not fully capture long-term dynamic changes in agricultural management practices. Despite these limitations, the study is expected to provide a systematic and replicable framework for optimizing idle land management using a Linear Programming approach, particularly in residential agricultural settings

3. Results and Discussion

3.1 Identification of Internal Factors

The results obtained consist of various costs associated with the production of bird's eye chili, curly chili, and eggplant, assuming that land rent has been paid, farmers already possess the necessary equipment, and labor costs can be minimized. This is due to the limited land area, allowing farmers to manage the land independently. Additional labor is only required during the initial land preparation stage and at harvest time to ensure efficiency in the cultivation process. Based on the observations and interviews conducted, the planting cost budget for a 250m² plot of land for cucumbers, bird's eye chili (*Capsicum frutescens*), curly chili (*Capsicum annuum*), and eggplant, as detailed in the table below, is as follows:

Table 1. Planting cost budget for a 250 m² plot for cucumbers, bird's eye chili, curly chili, and eggplant

No	Cost Type	Cucumber (Rp2.000.000)	Bird's eye chil (Rp 7.000.000)	Curly chili (Rp 6.000.000)	Eggplant (Rp 3.000.000)
1	Seeds/Saplings	200.000	1.000.000	800.000	300.000
2	Fertilizer (Organic/Chemical)	500.000	2.000.000	1.500.000	800.000
3	Pesticides/Pest Control	300.000	1.700.000	1.200.000	700.000
4	Plastic Mulch	400.000	400.000	400.000	400.000
5	Products Agricultural Equipment	100.000	300.000	200.000	200.000
6	Labor (Minimum)	200.000	1.350.000	800.000	400.000
7	Irrigation	300.000	500.000	400.000	300.000
8	Etc.	200.000	300.000	100.000	100.000
9	Total Cost	Rp2.200.000	Rp7.550.000	Rp5.400.000	Rp3.200.000
	Cost coefficient	1	3,43	2,45	1,45

Based on the table, it can be concluded that the cost of growing bird's eye chili is 3.5 times that of cucumbers, chili peppers 2.5 times that of cucumbers, and eggplant 1.5 times that of cucumbers. The following data was also obtained: the available land area is 1,000 m², with a capital of Rp10,000,000. The selling price per kilogram of the harvest is as follows: cucumbers Rp3,000, curly chili peppers Rp20,000, eggplants Rp5,000, and bird's eye chili peppers Rp30,000. During a single growing season, cucumber plants can be harvested three times. This means that the capital expenditure for cucumber cultivation is also three times that of other crops, and so is the harvest yield. In a single growing season, 1,000 cucumber plants can produce 2,500 kg, so the total harvest for the season reaches 3 × 2,500 kg = 7,500 kg. Meanwhile, the harvest yields of other crops in a single season are as follows: Eggplant: 2,000 kg, Curly chili: 800 kg, and Bird's eye chili: 1,500 kg.

Based on the data above, the problem can be formulated mathematically as follows: To determine the optimal land area for growing cucumbers, bird's eye chili peppers, curly chili peppers, and eggplants in order to maximize profit, we need to formulate this problem as an optimization problem with constraints on capital and land area. Here are the steps:

3.1 Decision Variables

The decision variables in this study were formulated based on the crop commodities cultivated by the farmer on the idle land located in the Highland Park residential area. Initial field observations and interviews indicated that the agricultural activities on the 1,000 m² plot primarily involved four horticultural crops: cucumbers, bird's eye chili peppers, curly chili peppers, and eggplants. These crops were consistently cultivated because they were considered suitable for the local land conditions and had relatively favorable market prospects.

In the Linear Programming model, each commodity was represented by a decision variable corresponding to the amount of land allocated for its cultivation. The decision variables used in this study were defined as follows:

- x_1 : land area allocation (m²) for cucumbers
- x_2 : land area allocation (m²) for bird's eye chili peppers
- x_3 : land area allocation (m²) for curly chili peppers
- x_4 : land area allocation (m²) for eggplants

These variables were used to identify the most optimal allocation of land resources in order to maximize farmers' income while considering existing production constraints, including land availability, production costs, labor capacity, and other supporting inputs.

3.2 Objective Function (Maximize Profit)

Profit is calculated as the harvest yield minus planting costs. The details are as follows:

3.2.1 Harvest Yield per Season

Cucumbers : (3 × 2,500 kg = 7,500 kg)
Bird's Eye Chili : (1,500 kg)
Curly Chili : (800 kg)
Eggplant : (2,000 kg)

3.2.2 Selling Price per Kg

Cucumbers : Rp 3,000/kg
Bird's Eye Chili : Rp 25,000/kg
Curly Chili : Rp 20,000/kg
Eggplant : Rp 5,000/kg

3.2.3 Revenue per Season per 250 m²

Cucumbers : (7,500 x 3,000 = 22,500,000)
Bird's Eye Chili : (1,500 x 25,000 = 37,500,000)
Curly Chili : (800 x 20.000 = 16.000.000)
Eggplant : (2000 x 5.000 = 10.000.000)

3.2.4 Planting Costs per Season per 250 m²

Cucumbers Cost : (c)
Bird's Eye Chili Cost: (3,5c)
Curly Chili Cost : (3c)
Eggplant Cost : (1,5c)

3.2.5 Profit per Season per 250 m²

Cucumbers : (22.500.000 - 3c)
Bird's Eye Chili : (37.500.000 - 3,5c)
Curly Chili : (16.000.000 - 3c)
Eggplant : (10.000.000 - 1,5c)

3.2.6 Objective Function

Maximize:

$$Z = \frac{22.500.000 - c}{250} x_1 + \frac{37.500.000 - 3{,}5c}{250} x_2 + \frac{16.000.000 - 3c}{250} x_3 + \frac{10.000.000 - 1{,}5c}{250} x_4$$

3.3 Constraints

3.3.1 Land Area Limits

$$x_1 + x_2 + x_3 + x_4 \leq 1000$$

3.3.2 Capital Constraint

The total investment cost must not exceed Rp 10.000.000:

$$\frac{c}{250} x_1 + \frac{3{,}5c}{250} x_2 + \frac{3c}{250} x_3 + \frac{1{,}5c}{250} x_4 \leq 10.000.000$$

3.3.3 Non-Negative Constraint

$$x_1, x_2, x_3, x_4 \leq 0$$

3.4 Solution

To solve this problem, we need to determine the value of (c) (the cost of planting cucumbers per 250 m²). If (c) is not given, we can either assume a value for (c) or solve the problem symbolically.

Assuming Value (c)
If (c = 2.000.000) (Cucumber plat cost per 250 m² is Rp 2.000.000). So:
- Bird's Eye Chili Cost: (3,5 x 2.000.000 = 7.000.000)
- Curly Chili Cost: (3 x 2.000.000 = 6.000.000)
- Eggplant Cost: (1,5 x 1.000.000 = 3.000.000)

Objective Function with (c = 2.000.000)

$$Z = 66.000\, x_1 + 122.000\, x_2 + 40000 x_3 + 28.000 x_4$$

Capital Constraints with (c = 2.000.000)

$$8.000 x_1 + 28.000 x_2 + 24.000 x_2 + 12.000 x_3 \leq 10.000.000$$

In terms of profit margins using a simple calculation method, bird's eye chili yields the highest profit, but it also requires a significant investment. The cost per square meter for bird's eye chili is 28,000, so with a budget of 10,000,000, you can plant 357 square meters; allocate the remainder to planting cucumbers, as they provide the highest profit. The cost of planting cucumbers is 8,000/m, so with a budget of 10,000,000, 1,250 m of land can be cultivated. The remaining available land, 643 m, is recommended for planting cucumbers. Eggplant and curly chili peppers were not planted as planned due to capital constraints. Therefore, the planting allocation is 357 m² for bird's eye chili peppers and 643 m² for cucumbers. The profit generated from this planting allocation is Rp. 85,992,000.

3.5 Solution Using the Linear Programming Method

By using the Linear Programming method with the help of Excel Solver, an optimization result was obtained that provides a clear picture of the best strategy for land allocation. Based on the generated Answer Report, the maximum revenue that can be achieved is Rp71,600,000. To achieve this value, the optimal land allocation involves planting cucumbers (x1) on 900 units of land and bird's eye chili (x2) on 100 units, while no land is allocated for curly chili (x3) or eggplant (x4). These results indicate that this combination is the most efficient use of available resources, while also providing maximum profit for the farmer.

Interpretation of the analysis results indicates that to maximize revenue, farmers should allocate 900 units of land for growing cucumbers and 100 units of land for bird's eye chili, while curly chili and eggplant need not be grown as they do not contribute to maximum revenue. Based on the Analysis Report from Excel Solver using the Linear Programming approach, the decision variables x1 (cucumbers) and x2 (bird's eye chili) have a reduced cost value of 0, meaning both are already in an optimal state and provide the best contribution to income. The allowable increase and allowable decrease values for these two variables indicate that changes in selling prices can still be tolerated within certain limits without

The interpretation of the analysis results indicates that to maximize revenue, farmers should allocate 900 units of land for growing cucumbers and 100 units of land for growing bird's eye chili, while curly chili and eggplant do not need to be grown because they do not contribute to maximum revenue. Based on the Analysis Report from Excel Solver using the Linear Programming approach, the decision variables x1 (cucumbers) and x2 (bird's eye chili) have a reduced cost value of 0, meaning both are already at their optimal levels and provide the best contribution to revenue. The allowable increase and allowable decrease values for these two variables indicate that changes in selling prices can still be tolerated within certain limits without altering the optimal solution. Conversely, variables x3 (curly chili) and x4 (eggplant) have negative reduced costs of -70,800 and -49,200, respectively, indicating that these two commodities would only be viable to grow if there is a minimum increase in selling price equal to those values. In terms of constraints, constraints c1 and c2 have positive shadow prices, namely 43,600 and 2.8, which show that every additional unit of resources, such as land or capital, will increase revenue by that amount.

Meanwhile, the allowable increase and allowable decrease values for each constraint represent the limits of changes in resource capacity that still maintain the shadow price.

Table 2. Table of results for the limit values of x1, x2, x3, and x4

x_1	x_2	x_3 dan x_4
• If cucumbers are not planted (x1 = 0), revenue drops sharply to 12,200,000. • If cucumbers are planted according to the optimal solution (x1 = 900), maximum revenue (71,600,000) is achieved	• If no bird's eye chili is planted (x2 = 0), revenue drops to 59,400,000. • If bird's eye chili is planted according to the optimal solution (x2 = 100), maximum revenue (71,600,000) is achieved.	• Growing curly peppers or eggplants does not increase income, because their optimal value is 0.

3.6 Optimization Results and Discussion

Based on the analysis results, it can be concluded that the optimal land allocation at this time is to focus on planting 900 units of cucumbers and 100 units of bird's eye chili, as these two crops provide the maximum contribution to income. Meanwhile, curly chili peppers and eggplants are not viable to plant under current conditions because they do not provide additional profit. If farmers still wish to plant curly chili peppers or eggplants, an increase in the selling price of Rp70,800 per unit for curly chili peppers and Rp49,200 per unit for eggplants is required to make them economically viable. Additionally, increased revenue can be achieved by adding resources such as land or capital, where each additional 1 unit on the first constraint (c1) will increase revenue by Rp43,600, and each additional 1 unit on the second constraint (c2) will increase revenue by Rp2.8. However, there is a risk of change if the selling price of cucumbers or bird's eye chili drops beyond the allowable decrease, causing the optimal solution to shift. Conversely, if the price of curly chili or eggplant rises above the reduced cost, both commodities could potentially become viable for cultivation. Therefore, it is recommended to maintain the current land allocation to maximize revenue, consider increasing selling prices if crop diversification is desired, and evaluate the possibility of adding resources, as this has been shown to significantly increase profits.

The results of a simple calculation can be summarized as follows: bird's eye chili: cost per meter: Rp 28,000. With a budget of Rp 10,000,000, an area of 357 m² can be planted. Profit: Highest (although the initial investment is large). Meanwhile, for cucumbers, the cost per meter is Rp 8,000; with a budget of Rp 10,000,000, an area of 1,250 m can be planted. Since the land area is limited (1,000 m) and 357 m has already been used for bird's eye chili, the remaining available land is 643 m, all of which is allocated for planting cucumbers. Eggplant and curly chili peppers are not planted because the capital has been exhausted. Planting Proportions: Bird's Eye Chili: 357 m² and Cucumbers: 643 m². The profit obtained based on this calculation is the total profit calculated according to these proportions (although the exact value is not specified in this simple analysis).

The results of the optimization using the Linear Programming method with the help of Excel Solver provide a clear and strategic overview of land management. The optimal allocation was achieved by planting cucumbers over an area of 900 square meters and bird's eye chili over an area of 100 square meters, while no land was allocated for curly chili or eggplant. This combination is capable of generating a maximum revenue of Rp71,600,000. Interestingly, these results are consistent with both a simple analytical approach and the Linear Programming method, both of which confirm that cucumbers are the most profitable commodity and thus deserve to be the top priority in land use. Furthermore, both methods agree that curly chili peppers and eggplants are not yet viable for cultivation under current conditions due to resource constraints, particularly regarding land and capital. Additionally, these optimization results demonstrate that the entire available land area of 1,000 square meters has been utilized efficiently to achieve maximum profit, making this allocation decision a strong foundation for planning more optimal and sustainable agricultural operations.

The results of this study indicate that the optimization approach using linear programming is an effective method for maximizing the utilization of idle land, particularly given constraints on capital and available land area. With a total land area of 1,000 m² and a limited budget of Rp 10,000,000, the optimization results show that allocating 900 m² to cucumbers and 100 m² to cayenne peppers yields a maximum profit of Rp 71,600,000. This strategy demonstrates that resource allocation focused on commodities with a high profit-to-cost ratio can significantly improve farming efficiency. Furthermore, these optimization results align with previous simple calculations that also identified chili peppers and cucumbers as top-performing crops. Although initial calculations indicated that chili peppers yield the highest profit per square meter, capital constraints led to the majority of the land being allocated to cucumbers, which have lower production costs.

4. Conclusion

This study demonstrates that the application of optimization theory through the Linear Programming approach can be effectively utilized in planning the agricultural use of idle land in the Highland Park residential area, Kota Serang Baru. The findings indicate that cucumbers contributed the highest share of income and therefore received the largest land allocation under the optimal solution. Bird's eye chili peppers were also identified as a profitable commodity with efficient resource utilization, making them suitable for further cultivation. In contrast, curly chili peppers and eggplants were not considered feasible under current conditions due to limitations in available capital and land resources.

The results further reveal that the Linear Programming approach provides a more systematic and reliable solution than simple analytical methods, as it simultaneously considers multiple production constraints, including land availability and capital limitations, while optimizing farmers' income. These findings suggest that optimization-based approaches can serve as a practical alternative for improving the management of idle land and supporting more efficient and economically sustainable farming practicesand should receive the largest land allocation.

5. Recommendation

There are several recommendations that can be considered for future research to improve the quality and accuracy of the analysis results. First, a comprehensive data validation is necessary, particularly regarding production costs, selling prices, and profit margins per meter, to ensure consistency between the results of simple analysis and Linear Programming optimization. Second, future research is advised to develop an approach using more complex optimization methods, such as stochastic programming, to accommodate elements of uncertainty, especially in fluctuations of selling prices and production costs. Third, it is also important to conduct a sensitivity analysis to determine the extent to which changes in key parameters, such as prices and costs, can influence optimal land allocation decisions. With these steps, it is hoped that future research results will be more robust, adaptive, and relevant to real-world conditions in the field.

Author Contributions

Conceptualization: Een Mardiyanti
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Investigation: Een Mardiyanti and Kania Asri Liany
Methodology: Een Mardiyanti and Kania Asri Liany
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