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Assessment of Weed Control Practices in Immature Oil Palm Plantations

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ABSTRACT

Weed control is an important maintenance activity in immature oil palm (TBM) plantations because weeds can inhibit plant growth through competition for nutrients, water, light, and growing space. This study aimed to identify weed species, evaluate manual and chemical weed control practices, and compare weed control costs in Division III of Gunung Bayu Estate, PT Perkebunan Nusantara IV Regional II, in 2024 and 2025. The study was conducted from May to August 2026 using a descriptive method. Data were collected through field observations, interviews, documentation, and secondary company data. The results showed that 10 weed species were identified in the 98-ha immature oil palm area, consisting of broadleaf weeds, grasses, sedges, woody weeds, and ferns. Weed control was implemented using an integrated approach involving manual and chemical methods according to the characteristics of the weeds in the field. The total cost of weed control increased from IDR 146,537,340 in 2024 to IDR 187,265,430 in 2025. The increase in total cost was mainly attributed to higher labor costs, despite a decrease in herbicide costs. Therefore, the implementation of integrated weed control practices supported the maintenance of immature oil palm plantations; however, cost efficiency remained constrained by the high labor requirements.

Keywords: Weeds, Weed Control, Oil Palm, Immature Oil Palm, Cost

INTRODUCTION

Immature oil palm (TBM) plantations have relatively open spaces between plants because the canopies have not yet fully overlapped. This condition promotes significant weed growth in immature oil palm areas and presents a major challenge, particularly due to the high cost of weed control. Weed growth in immature oil palm plantations can cause competition between weeds and oil palm plants for essential nutrients (Iskandar & Yudiawati, 2022). The interference of unwanted plants with the growth and development of main crops indicates the emergence of weed-related problems. According to Mahardika et al. (2022), the presence of weeds is one of the

major challenges in oil palm cultivation, particularly during the immature oil palm (TBM) stage. Weeds are plants that grow in oil palm plantations and, if not properly controlled, can negatively affect oil palm growth and increase weed control costs. Weed infestation in immature oil palm (TBM) areas can cause various problems, including reduced crop productivity, serving as hosts for pests and diseases, inducing phytotoxic effects on the main crop through allelopathy, and hindering field operations (Prasetyo & Zaman, 2016). Weeds can inhibit the growth and development of oil palm, particularly during the immature oil palm (TBM) stage, by competing with the main crop for nutrients, light, and water. According to Yakup and Angraeni (2023), the presence of weeds in oil palm plantations can reduce plant growth and productivity. The weed species controlled manually include *Clibadium suriname, Melastoma malabathricum, Chromolaena odorata,* and *Lantana camara*. Meanwhile, several weed species controlled chemically include *Monochoria vaginalis, Limnocharis flava, Eichhornia crassipes, Amaranthus spinosus, Portulaca oleracea,* and *Lindernia* sp. (Nufvitarini et al., 2016). In general, oil palm plantations control weeds using two methods: manual and chemical control. Chemical weed control involves the use of equipment, materials, and labor, with herbicides as the main control agents. In contrast, manual weed control uses tools such as machetes, hoes, and brush cutters, which require considerable time and labor. According to Budi et al. (2020), manual weed control requires more labor, although its implementation can be completed within a shorter period. This method is considered more practical and advantageous than chemical weed control. The use of herbicides as a chemical control method is considered more effective in suppressing weed growth; however, improper or excessive use may pose risks to the environment. Therefore, sustainable and environmentally friendly weed control is essential to maintain the balance of soil and water ecosystems in oil palm plantations.

MATERIALS AND METHODS

Place And Time

The study was conducted in Division III of Gunung Bayu Estate, PT Perkebunan Nusantara IV Regional II, Bosar Maligas District, Simalungun Regency, North Sumatra Province. The study was carried out from May to August 2026.

Materials And Tools

The materials used in this study were immature oil palm plants (TBM II), carbosulfan, lambda-cyhalothrin, deltamethrin, cypermethrin, acephate, and water.

The equipment used in this study included a knapsack sprayer, jerry cans, a graduated measuring cylinder, syringes, a digital scale, a spoon, and writing materials.

Research Method

This study employed a descriptive method by collecting primary and secondary data from Division III of Gunung Bayu Estate, PT Perkebunan Nusantara IV Regional II, Bosar Maligas District, Simalungun Regency, North Sumatra Province. The data were processed using Microsoft Excel to assist in data organization and presentation. The data collected included general information about the plantation, data on manual weed control (labor costs) and chemical weed control (equipment costs, herbicide costs, and labor costs), data on the implementation of manual and chemical weed control in immature oil palm plantations in 2024 and 2025, and data on the costs of manual and chemical weed control in immature oil palm plantations in 2024 and 2025.

RESULTS AND DISSCUSSION

Field observations showed that 10 weed species were found in Division III of Gunung Bayu Estate. The weed species identified in Division III of Gunung Bayu Estate, PT Perkebunan Nusantara IV Regional II, are presented below.

Table 1. Wees Species in Division III of Gunung Bayu Estate

Weed Type	Common Name	Scientific Name	Control Method
Broadleaf Weeds	Babadotan	*Ageratum conyzoides*	Chemical
	Jarong	*Achyranthes aspera*	Chemical
	Kentangan	*Borreria latifolia*	Chemical
Grasses	Alang-alang	*Imperata cylindrica*	Chemical
	Jakut pahit	*Axonopus compresus*	Chemical
	Putri malu	*Mimosa pudica*	Chemical
Sedges	Teki ladang	*Cyperus rotundus*	Chemical
Woody Weeds	Daun leben	*Vitex pinnata*	Manual
	Pulutan	*Urena lobata L*	Manual
Ferns	Pakis paku	*Pteridophyta*	Manual

Based on Table 1, the weed species found in Division III of Gunung Bayu Estate consisted of broadleaf weeds, grasses, woody weeds, and ferns. The broadleaf weed group was dominated by babadotan (*Ageratum conyzoides*), jarong (*Achyranthes*

aspera), and kentangan (*Borreria latifolia*). These weed species exhibit rapid growth and high adaptability, enabling them to compete with oil palm plants for nutrients, water, and sunlight. Therefore, their control was carried out chemically using contact and systemic herbicides according to the characteristics of the target weeds.

The equipment used served to support field operations, enabling weed control activities to be carried out effectively. Equipment costs were determined based on the type of equipment, the number of units used, and the unit price of each item. The details of the equipment costs used for weed control activities in Division III of Gunung Bayu Estate in 2024–2025 are presented in Table 2.

Table 2. Weed Control Equipment Costs in Division III in 2024 and 2025

Equipment Type	Quantity	Unit Price	Total Price
Hoe	10	60.000 IDR	600.000 IDR
Rake	10	60.000 IDR	600.000 IDR
Knapsack Sprayer	8	450.000 IDR	3.600.000 IDR
Total			4.800.000 IDR

The procurement of work equipment, including hoes, rakes, and knapsack sprayers, was carried out to support manual and chemical weed control activities in Division III of Gunung Bayu Estate. Ten units each of hoes and rakes were purchased at a unit price of IDR 60,000, resulting in a total cost of IDR 600,000 for each type of equipment. Meanwhile, eight knapsack sprayers were purchased at a considerably higher unit price of IDR 450,000, resulting in a total cost of IDR 3,600,000. The total procurement cost for the three types of equipment was IDR 4,800,000.

Table 3. Material Costs in Division III in 2024

Type of Work	Material Type	Dosage	Unit Price (IDR)	Material Usage	Total Cost (IDR)
Chemical Control of Circle and Harvesting Path	Glyphosate (L)	600 cc	52.000	367,20	19.094.400
	Methyl Metsulfuron (Kg)	15 g	500.000	9,18	4.590.000
Chemical Control of Main Road (MB)	Starane (L)	60 cc	250.000	35,28	8.820.000
Wiping	Glyphosate (L)	10 cc	52.000	0,60	31.200
Total				412,26	32.535.600

Table 4. Material Costs in Division III in 2025

Type of Work	Material Type	Dosage	Unit Price (IDR)	Material Usage	Total Cost (IDR)
Chemical Control of	Glyphosate (L)	600 cc	52.000	352,80	18.345.600

Circle and Harvesting Path	Methyl Metsulfuron (Kg)	15 g	350.000	8,82	3.087.000
Chemical Control of Main Road (MB)	Starane (L)	60 cc	200.000	35,28	7.056.000
Wiping	Glyphosate (L)	10 cc	52.000	1,20	62.400
	Total			398,10	28.551.000

In 2025, the unit price of glyphosate was IDR 52,000 per liter, while the price of methyl metsulfuron decreased to IDR 350,000 per kilogram compared with 2024. In addition, the price of Starane also decreased to IDR 200,000 per liter. The decrease in the prices of several active ingredients resulted in a reduction in the total material cost incurred for weed control activities in the immature oil palm (TBM) area in 2025 to IDR 28,551,000. Based on the immature oil palm area of 98 ha, the average weed control material cost was IDR 291,337 per hectare per year. This value was lower than the 2024 cost, which reached IDR 331,996 per hectare per year, indicating material cost savings of IDR 40,659 per hectare. The decrease in material costs was mainly influenced by the lower prices of methyl metsulfuron and Starane, while the price of glyphosate remained unchanged.

Table 5. Labor Costs in Division III in 2024

Type of Work	Norm (US/Ha)	Area (Ha)	Frequency	Cost/US (IDR)	Monthly Cost (IDR)	Annual Cost (IDR)
Chemical Control of Circle and Harvesting Path	1	98	6	80.000	7.840.000	47.040.000
Chemical Control of *Mucuna bracteata*	1	98	6	80.000	7.840.000	47.040.000
Manual Removal of Woody Weeds	0,3	98	4	80.000	2.352.000	9.408.000
Lalang Wiping (10%)	0,5	10	6	190.458	952.290	5.713.740
		Total			18.984.290	109.201.740

Table 6. Labor Costs in Division III in 2025

Type of Work	Norm (US/Ha)	Area (Ha)	Frequency	Cost/US (IDR)	Monthly Cost (IDR)	Annual Cost (IDR)
Chemical Control of Circle and	1	98	6	87.000	8.526.000	51.156.000

Harvesting Path						
Chemical Control of *Mucuna bracteata*	1	98	6	87.000	8.526.000	51.156.000
Manual Removal of Woody Weeds	0,3	98	4	87.000	2.557.800	10.231.200
Removal of Climbing Weeds	1	98	3	157.045	15.390.410	46.171.230
		Total			35.000.210	158.714.430

Labor costs for weed control in the 98-ha immature oil palm (TBM) area consisted of circle and harvesting path chemical control, *Mucuna bracteata* chemical control, manual removal of woody weeds, and climbing weed removal. The total labor cost incurred reached IDR 35,000,210 per month or IDR 158,714,430 per year. The highest costs were incurred for circle and harvesting path chemical control and *Mucuna bracteata* chemical control, each amounting to IDR 51,156,000 per year, followed by climbing weed removal at IDR 46,171,230 per year and manual removal of woody weeds at IDR 10,231,200 per year. Based on the immature oil palm area of 98 ha, the average labor cost for weed control was IDR 1,619,535 per hectare per year. This value indicates that labor requirements in 2025 increased compared with the previous year, in line with the increase in labor costs per unit and changes in the types of field activities.

Table 7. Summary of Weed Control Costs

Biaya	2024 (IDR)	2025 (IDR)
Equipment	4.800.000	-
Materials	32.536.000	28.551.000
Labor	109.201.740	158.714.430
Total	**146.537.340**	**187.256.430**

Based on the summary of manual and chemical weed control costs, equipment procurement costs were incurred in 2024 amounting to IDR 4,800,000, while no weed control equipment was purchased in 2025. In 2024, total material costs were higher, amounting to IDR 32,535,600, because the unit prices of methyl metsulfuron and Starane herbicides were higher than those in 2025. Meanwhile, the highest labor costs were recorded in 2025, amounting to IDR 158,714,430. This increase was attributed to higher labor costs per US and the implementation of climbing weed removal, which replaced lalang wiping activities, resulting in higher overall weed control costs.

CONCLUSION

Based on the study entitled Assessment of Weed Control Practices in Immature Oil Palm Plantations, the following conclusions can be drawn:

1. The weed species identified consisted of broadleaf weeds, grasses, woody weeds, sedges, and ferns. Several dominant weed species included *Ageratum conyzoides*, *Achyranthes aspera*, *Borreria latifolia*, *Imperata cylindrica*, *Axonopus compressus*, *Mimosa pudica*, *Vitex pinnata*, *Urena lobata*, *Cyperus rotundus*, and *Pteridophyta*.
2. Weed control in immature oil palm (TBM) plantations in Division III of Gunung Bayu Estate was carried out using manual and chemical methods. Manual control was primarily conducted through manual weed removal, while chemical control involved the use of herbicides selected according to the weed species and field conditions.
3. The total cost of weed control in the 98-ha immature oil palm area in 2024 was IDR 146,537,340, equivalent to IDR 1,495,279 per hectare. In 2025, the total weed control cost increased to IDR 187,265,430, equivalent to IDR 1,910,870 per hectare.

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