

The Effectiveness of Progressive Pruning on Looses Production

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Article History: Received: 30 June 2025, Final Revision: 10 July 2025, Accepted: 20 July 2025, Online Publication: 30 July 2025

ABSTRACT

Oil palm canopy is formed every month as many as 1-3 fruits, depending on the age and growth of the plant. Each oil palm canopy supports the formation of leaf/frond positions that are arranged in a spiral. Progressive pruning of the main shoots is carried out directly by harvest workers (not the Special Main Shoot Work Team) and is carried out simultaneously when cutting the fruit while still referring to the basic principle of the number of productive fronds that must still be maintained according to the provisions (leaf area index). This study aims to determine the role of the progressive pruning system in minimizing losses (bunches and loose fruit) in oil palm plantations. The basic method used in this study is a quantitative descriptive method using t-test analysis, the parameters used are the losses of bunches and loose fruit. The conclusion of the study is that the progressive pruning system can reduce losses of oil palm fruit (bunches) and loose fruit, compared to the periodic pruning system at the overall losses point of the three losses point chains, namely at the main, plate and market.

Keywords: Progressive Pruning, Production Losses

INTRODUCTION

The main shoot is a job that contains two contradictory aspects, namely to maintain maximum production where as many productive fronds as possible are needed, but on the other hand, in order to facilitate the work of cutting the fruit and minimize production losses, some fronds must be cut. The core of the main shoot's job is to maintain productive fronds by reducing the number of fronds to a certain limit that does not disrupt the leaf's ability to carry out optimal photosynthesis for vegetative and generative growth. The oil palm frond is an oil factory, where the leaves are the site of the

photosynthesis process whose final result determines the formation of the fruit

Both the quantity and quality of the fruit to be harvested are important. Therefore, based on field experience, to achieve maximum production, an optimum number of fronds is required, namely 48-56 fronds (young plants) and 40-48 fronds (old plants). To achieve the goal of main shoots, excessive frond shoots (over-pruning) and/or slow frond shoots (under-pruning) must be avoided. This principle of main shoots is commonly known as frond management. Over-pruning is the removal of an excessive number of productive

fronds, which will result in decreased production. Under-pruning is the delay in maintaining unproductive fronds, resulting in long-stemmed trees. Under-pruning disrupts fruit cutting operations, thus suboptimal harvest output and increasing production losses. Main shoots are pruned periodically with a nine-month rotation, resulting in 1.3 rotations per year. Planning for the current year's main shoots in each area/block must be based on the last rotation. Assistants must form a dedicated main shoot work group (team). The budding personnel must be trained and must not be replaced by individuals unfamiliar with budding. Backup budding personnel are needed if one of the main budding personnel is sick or absent. These backup budding personnel can be either maintenance personnel experienced in budding or harvest personnel (when fruit is low or slow). Periodic budding transfers from block to block within a single division must be systematic (clockwise or counterclockwise). Progressive pruning of the main shoot (progressive pruning) is carried out directly by the harvesting personnel (not the Special Main Shoot Work Team) and is carried out simultaneously with fruit cutting, while adhering to the basic principle of maintaining the number of productive fronds according to the leaf area index. Oil palm plants must be pruned to facilitate harvesting and to prevent nutrients from being absorbed by unproductive fronds. However, some oil palm plants, such as those over 25 years old or unproductive, are not pruned. Pruning involves trimming or cutting the lowest or unproductive oil palm fronds, such as sengkleh fronds, damaged fronds, and fronds not part of the fruit support using an eggrek or dodos tool, depending on the plant's height. Pruning is done by leaving the fruit support, or songgo. Songgo is a frond that supports or holds the fruit so that the fruit can ripen optimally on the tree. Songgo one

means eight fruit support fronds or one spiral row.

Songgo dua means a fruit support with 16 fronds, or two spiral rows. The pruning technique of using songgo satu will lead to overpruning for trees with few fruit bunches per tree (Junaedi, 2019).

Frond pruning (pruning) is one of the technical cultural tasks required to increase oil palm productivity. According to (Alridiwersah et al., 2020), pruning involves removing unproductive plant parts to encourage new shoots that will produce fruit. Pruning affects the rate of photosynthesis because if unproductive fronds are not pruned, plant nutrients will be distributed to the unproductive fronds, thus freeing up nutrients for the remaining productive fronds.

Pruning has many benefits for plants, including improving plant health, stimulating flowering, and increasing production. According to Pahan (2012), this task involves two contradictory aspects: maintaining productive fronds (still green leaves), while simultaneously pruning them to facilitate harvesting and minimize loss (fruits stuck in the fronds). Proper pruning must avoid excessive frond growth (over-pruning) or slow frond growth (under-pruning). Over-pruning is the removal of an excessive number of productive fronds, resulting in decreased production. Under-pruning is the delay in maintaining unproductive fronds, disrupting fruit harvesting, resulting in suboptimal harvest output and increased production losses. In addition to increasing fruit productivity, pruning oil palm plantations, especially those along residential or urban roadsides, has a positive impact on the company by adding aesthetic value or beauty, attracting visitors and potentially developing

agro-tourism (Junaedi, 2019).

Progressive pruning is a crucial aspect of oil palm canopy management. Progressive pruning is carried out as an effort to create better plant conditions (Zamzami et al., 2012). Progressive pruning is carried out by cutting old oil palm fronds with the aim of regulating

leaf surface area. Progressive pruning is carried out during the harvest process (Gromikora et al., 2014). Regulation of leaf surface area through budding is necessary to balance photosynthetic capacity. Long and excessive fronds cause fronds to shade each other and overlap, which has a negative effect on assimilate production (Gerritsma., 1990).

MATERIALS AND METHODS

This research was conducted at PT. KAL. Sei Tuang Estate, Penawang Village, Siluq Ngurai District, West Kutai Regency, East Kalimantan Province. The oil palm plantations were planted in 2012 and 13 years old. The research was conducted from October to December 2023.

The tools used in this study were a hoe, a hoe, a calculator, a dodos (a wooden dodo), a sack, a machete, and a scale. The materials used in this study were Block B38 (Periodic Block) and B36 (Progressive Pruning Block). The method for collecting primary data samples within a block, taking 10% of the sample, refers to research by Prabowo and Purwono (2010) and Fais et al. (2016). Sampling observations were conducted by taking primary samples within a block, with each row spaced 10 rows apart.

Observations of bunches and loose fruit were conducted by observing, monitoring, and

observing them weekly for eight weeks, meaning eight harvest rotations over two months. The parameters for bunch and loose fruit loss were measured on trees that had undergone progressive pruning and those that had not undergone progressive pruning in two different blocks. Observations were conducted at seven pikul markets within one block, resulting in a total of 14 pikul markets, with 58 trees per market.

Data analysis of the effectiveness of progressive pruning on managing production loss was conducted using a t-test. Data analysis was performed using a t-test to compare the loss before and after the progressive pruning treatment. The t-test is a statistical method used to determine whether there is a significant difference between two data sets. This calculation is used to descriptively observe the increasing or decreasing trend in the loss point before and after the progressive pruning treatment.

RESULTS AND DISCUSSION

The following is a discussion of the research results on the effectiveness of progressive

pruning in managing looses at PT. KAL.

Table 1. Data on the Effect of Canopy Management on Fruit Looses in Oil Palm Plantations

DESCRIPTION			CROP ROTATION								MEAN	STANDART DEVIATION	SIG
			1	2	3	4	5	6	7	8			
LOOSES FRUIT STAY	TREE	PERIODIK	7	13	10	12	20	11	10	11	11,75	3,770	0,00005
		PROGRESIF	0	1	0	0	0	0	0	0	0,13	0,354	
	CIRCLE	PERIODIK	0	1	0	0	0	0	2	0	0,38	0,744	0,19702
		PROGRESIF	0	0	0	0	0	0	0	0	0,00	0,000	
	PP & TPH	PERIODIK	0	0	0	0	0	0	2	0	0,25	0,707	0,35062
		PROGRESIF	0	0	0	0	0	0	0	0	0,00	0,000	
	TOTAL LOOSES	PERIODIK	7	14	10	12	20	11	14	11	12,38	3,815	0,00004
		PROGRESIF	0	1	0	0	0	0	0	0	0,13	0,354	
LOOSES BRONDOLAN STAY	TREE	PERIODIK	98	86	119	116	141	184	100	144	123,50	31,785	0,00013
		PROGRESIF	31	37	24	18	17	19	19	10	21,88	8,560	
	CIRCLE	PERIODIK	38	40	35	0	17	0	11	0	17,63	17,703	0,09094
		PROGRESIF	12	0	7	8	3	5	5	3	5,38	3,662	
	PP & TPH	PERIODIK	57	43	0	0	0	0	18	0	14,75	22,933	0,16143
		PROGRESIF	9	0	2	2	3	4	2	0	2,75	2,866	
	TOTAL LOOSES	PERIODIK	193	169	154	116	158	184	129	144	155,88	26,194	0,00000
		PROGRESIF	52	37	33	28	23	28	26	13	30,00	11,364	

information :

PP & TPH : Pasar Pikul & Place of collection of result

Periodic : Pruning System Periodic

Progressive : Pruning System Progressive

Total Unit : looses fruit stay (Bunch), Looses brondolan stay (Item)

Oil palm crowns produce 1-3 fruit trees each month, depending on the age and growth of the plant. Each oil palm crown supports the formation of leaves/fronds, which form a spiral. Leaf phyllotaxis follows the 3/8 formula, meaning that for every three (3) turns around the spiral, there are eight leaves (excluding the first leaf). The spiral rotation is sometimes to the left and sometimes to the right, due to genetic factors.

Progressive pruning of the main shoot is carried out directly by harvesters (not the Special Main Shoot Work Team) and is carried out simultaneously with fruit cutting, while adhering to the basic principle of maintaining the number of productive fronds (leaf area index). Additional tasks and responsibilities for frond maintenance (progressive main

shoot) are compensated by harvesters in the form of a "progressive main shoot premium," the amount of which is determined by the budget and paid periodically. The shuffling pattern of the harvest system can also be used as a main shoot pruning, allowing productive frond maintenance to occur simultaneously with fruit cutting. The daily progressive main shoot pruning process must be guided by the Harvest Foreman, with the primary consideration being that "there should be no reason for the harvest to be incomplete due to harvesters performing progressive main shoots."

Harvesting operations exploit production potential. Increasing production exploitation means minimizing production losses. Palm oil (CPO) and palm kernel (PK) production per

hectare in a plantation can indicate whether the production level has been maximized. Maximum production can only be achieved if production losses are minimized. The fruit cutting rotation is the most crucial aspect or factor in the field for achieving high production per hectare, low cost per kilogram, and low FFA. The fruit cutting rotation also affects transportation and processing at the mill. The fruit cutting rotation must be maintained for 7 (seven) days to ensure production quantity and quality. The general criterion for harvestable fruit bunches is the number of loose fruit that detaches from the bunch and falls to the ground naturally, or in other words, produces a certain number of loose fruit. "For every 1 kg of bunch weight, there are 2 loose fruit bunches on the plate that are not parthenocarpic fruit bunches or young fruit bunches due to rat attacks or disease", for example, if the BJR (average bunch weight) of the block is 10 kg, then the fruit that can be harvested on the block is This is if there are 20 loose fruit bunches on the disc. If there are only 19 loose fruit bunches, they are considered unripe. If the fronds must be cut or if a progressive pruning policy is in place, the fronds are cut close to the stem to prevent the fronds from getting caught and to avoid difficulties with the next harvest. Cut fronds that must be cut according to the songgo (planting schedule) requirements.

The company previously used a periodic pruning system with a budget of 1.3 rotations annually. However, technical constraints in the field caused the periodic pruning to not work properly due to : Lack of labor, Lack of skilled labor, Low output and High shoot quality

This results in damaged plant condition due to under- and over-pruning. While songgo 2 is the company's standard, over-pruning impacts the plant's metabolism. When 75% of the fronds

are removed from young plants, the photosynthesis rate of the remaining fronds increases in trees with fresh fruit bunches, but not in trees without fresh fruit bunches. At the same time, the KH content decreases in trees with bunches but not in trees without bunches. The rate of photosynthesis is stimulated by the growth of assimilates sinks. The photosynthetic rate of young plants is related to the number of oil palm bunches. The photosynthetic rate of young plants almost doubles 2 months before the first bunch is harvested, when assimilates will be needed for oil synthesis. The source-sink relationship is through the phloem, where the translocation of sucrose (as well as amino acids, hormones, and several inorganic ions such as K, Mg, P, and Cl) takes place. Phloem loading occurs in the leaves, 3C sugar (glyceraldehyde-3-phosphate) resulting from photosynthesis is transported from the chloroplasts to the cytosol and here it is converted into sucrose. Sucrose moves from the mesophyll cells into the phloem vascular bundles. Phloem unloading: the movement of sucrose from the phloem and its distribution into the sink cells that store or metabolize it → fruit bunches. Over-pruned oil palm trees tend to have fewer bunches and a low average bunch weight (AGB).

In blocks experiencing under-pruning, production declines significantly due to incomplete crop rotation, leading to harvest losses. This becomes a management focus related to "Yield Making" and "Yield Taking." Yield making is implemented through various block-by-block and tree-by-tree management methods, including: Fertilization, Weed control, Management of marginal areas and Management of plant pests and diseases.

However, it becomes a significant loss when yield making is implemented and trees produce many bunches, but problems arise during yield

taking, or the process of harvesting, due to under-pruning.

Progressive pruning is a solution because the harvester handles the pruning directly without the assistance of other labor. The pruning process is carried out in installments at each harvest. This means that using a 7-day harvest cycle, the same block can be harvested four times in a month. This progressive pruning also prevents the oil palm tree from experiencing decreased metabolism or stress due to wounds caused by the cut fronds. This progressive pruning is also supported by the following harvesting system: Family couples (husband and wife employees) harvest harvesters. A fixed number of harvesting racks (ancak) of 6 harvesting racks. Motorized facilities for transporting harvested bunches

CONCLUSION

Conclusion: Based on the research conducted, it can be concluded that: The progressive pruning system can reduce losses of oil palm fruit (bunches) and loose fruit, compared to the periodic pruning system at all loose points across the three loose points chain: the tree trunk, the plate, and the picket market.

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Observations in the observation table show that progressive pruning can reduce the number of loose fruit bunches and loose fruit bunches. Furthermore, progressive pruning also ensures neat and well-maintained harvest racks (songgo 2), resulting in complete harvesting and maximum yields.

Therefore, the table above shows that blocks that underwent progressive pruning had higher production than blocks that did not.

In terms of benefits for the company, it will also increase due to the achievement of maximum production. Furthermore, the advantages of the progressive pruning system include: Maintaining the canopy in songgo 2, Tidier block conditions, Minimal harvest losses, Increased production, Increased harvester income

The reduced number of loose points at the three loose points chain: the tree trunk, the plate, and the picket market, results in higher production in blocks subjected to progressive pruning compared to blocks subjected to periodic pruning.

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