Jurnal Bisnis Tani
AGRIBISNIS - UNIVERSITAS TEUKU UMAR

Bisnis Tani, Vol. 12, No. 1, 2026
https://jurnal.utu.ac.id/jbtani
ISSN 2477-3468 (print), 2714-7479 (online)
DOI: 10.35308/jbt

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Revitalizing Palm Oil Production Based on a Comparison of Actual and Ideal Production at PT. Agro Sinergi Nusantara Kebun Batee Puteh, West Aceh

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Abstract
Oil palm productivity is influenced by plant age, land suitability, and plant population density per hectare. This study aimed to analyze the gap between actual fresh fruit bunch (FFB) production and ideal production based on Indonesian Oil Palm Research Institute (PPKS) standards at PT. Agro Sinergi Nusantara Batee Puteh Estate, West Aceh. Secondary data from 2015–2024 were analyzed descriptively by comparing actual, potential, and ideal production. The results showed a significant gap between actual and potential yields. At peak productive age (9–10 years), potential yields reached 34–35 ton ha^{-1}, while actual yields only reached 7.43–8.40 ton ha^{-1}. Suboptimal plant population density (60–70 palms ha^{-1}) and management constraints were identified as the main limiting factors. Plantation revitalization through population improvement and better agronomic management is required to enhance sustainable oil palm productivity

Keywords: *oil palm, actual yield, ideal yield, plant density, plantation management*

1. INTRODUCTION

Oil palm (*Elaeis guineensis Jacq*.) is a leading commodity in the plantation sector which plays an important role in the Indonesian economy through its contribution to exports, employment absorption, and rural area development (Corley & Tinker, 2016). Oil palm productivity is largely determined by the age of the plant, land suitability, plant population density, and the implementation of sustainable plantation management (Pahan, 2012). The Palm Oil Research Center (PPKS) has set standards for the potential production of Fresh Fruit Bunches (FFB) based on land suitability classes (S-1, S-2, and S-3) and optimal plant density of 143 trees per hectare at the start of planting or ±74 productive trees per hectare in the production phase (PPKS, 2018). This standard is a reference inevaluate the production performance of oil palm plantations in Indonesia.

However, on many plantations, actual production remains far below the established potential. The difference between actual and potential production often reflects agronomic and managerial issues, such as plant loss, unbalanced fertilization, and suboptimal harvest management (Woittiez et al., 2017). PT. Agro Sinergi Nusantara Kebun Batee Puteh Aceh Barat is one of the plantations facing the problem of low actual production compared to the PPKS standard. Therefore, this study aims to analyze the comparison between actual and ideal production and identify the factors causing low oil palm productivity as a basis for garden revitalization recommendations (Sunarko 2014).

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2. METHOD

2.1 Place and Time

This research will be conducted in PT. Agro Sinergi oil palm plantation Nusantara or PT. ASN Kebun Batee Puteh Regency, West Aceh Province Aceh. Selection of objects and locations research was conducted based on tohenconsideration that the company is a subsidiary of a state-owned enterprise Holding PT. Perkebunan Nusantara I and PT. Perkebunan Nusantara IV which have good company management. Next, the research was carried out for four months or in July until October 2025.

2.2 Population and Sample

Population is a group or all elements , whether individuals, objects, events, or units of analysis that have one or more characteristics in common, and become the target of generalization to be studied, conclusions are drawn (Raymond & Darsaut, 2025), whereas a sample is a part of the expected number or characteristics of the population can represent or be representative of the population to be studied (Sugiyono, 2022). The population of this study is the staff and employees of PT. Agro Sinergi Nusantara or PT. ASN Kebun Batee Puteh. The research sample was selected intentionally or purposively (sample determination) with certain considerations), where those selected are those who truly understand plantation operations based on their respective fields. For Manager and Staff respondents taken as a full sample or 100% considering that this group is the most understand the company's operations, administration, and finances. To respondents from plant or agronomy employees were taken 13%, and the sample of administrative employees was 44% with sample selection based on recommendation or appointment from leader or superior, because of leadership or superiors who know whether prospective employee respondents really understand plantation operations based on their respective fields, and also know more details about the conditions conflict and post-conflict that affect company operations in the field. The population and sample of the study.

2.3 Data source

Data sources used in this study is primary data and secondary data is: Primary Data (data on land and plant conditions) directly observed in the field and the results of interviews with selected respondents and perception data and qualitative information with selected respondents regarding the history of the plantation, operational problems, impacts of conflict, potential for revitalization, as well as hopes and challenges related to the future of the plantation). Secondary Data (Company data in the form of HGU area and maps, productivity data in the form of recording TBS production per block or division of monthly or annual plantation records, company data from related agencies in the form of statistical data oil palm plantations from the West Aceh District Plantation Service, Aceh Agriculture and Plantation Service, Literature data from journals, scientific papers, books, research reports, and publications that relevant to palm oil, management plantations, agricultural economics, studies conflict and post-conflict in Aceh.

2.4 Data collection

Data Collection Methods Used Other Methods between data collection in principle serves to express information and variables to be studied. In this study the technique used used in data collection are: Observation, Questionnaires, In-depth Interviews or In- depth interview, literature study and documentation As a plantation company PT. ASN's palm oil is

2.5 Data Analysis

Data analysis methods are carried out using a qualitative and quantitative analysis approach, meaning that the research using numbers as a tool analysis and also opinions from respondents to strengthen or clarify phenomena that occur. Analysis method data will be adjusted according to data type collected. The research framework in this study is the condition of the plantation, the condition of the oil palm plants, production. Actual, Ideal production, Actual revenue, Ideal revenue and Budget requirements revitalization.

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3. RESULTS AND DISCUSSION

3.1 History of the Company's Establishment

PT Agro Sinergi Nusantara atau PT ASN Kebun Batee Puteh merupakan salah satu perusahaan perkebunan kelapa sawit yang beroperasi di Kabupaten Aceh Barat dan Aceh Jaya. Perusahaan ini didirikan berdasarkan Akta Notaris Ihdina Nida Marbun, S.H. Nomor 12 tanggal 8 April 2011, serta telah memperoleh pengesahan dari Menteri Hukum dan Hak Asasi Manusia Republik Indonesia melalui Keputusan Nomor AHU-25181.AH.01.01 Tahun 2011 tanggal 19 Mei 2011. Pendirian perusahaan tersebut juga telah diumumkan dalam Berita Negara Republik Indonesia Nomor 72 tanggal 7 September 2012. Dalam perkembangannya, perusahaan mengalami beberapa kali perubahan akta, dengan perubahan terakhir berdasarkan Akta Notaris Ihdina Nida Marbun, S.H. Nomor 01 tanggal 24 September 2016, yang telah memperoleh persetujuan dari Kementerian Hukum dan Hak Asasi Manusia Republik Indonesia Nomor AHU.AH.01.03-0093409 Tahun 2016 tanggal 27 Oktober 2016.

As a palm oil plantation company, PT. ASN is a company cooperation or joint venture between State-Owned Enterprises PTPN I and PTPN IV with share ownership of 35.23% and 64.77%, respectively. PT. ASN building and managing palm oil plantations and factories with business locations spread across 5 districts/cities in Aceh Province, namely Aceh Jaya Regency, Aceh West, Nagan Raya, South Aceh and the Subulussalam City Government. This research was conducted at the Batee Puteh Garden, Aceh Jaya and West Aceh Districts, and to manage its operations, Kebun Batee has an office on Jl. Ujong Beurasok No. 25 Lapang Village, Johan Pahlawan District, West Aceh Regency, City Meulaboh - Aceh.

The status of the company operating as a formal business entity provides a strong legal foundation for carrying out plantation management effectively professional and sustainable (Hasnidar, 2023). This collaborative structure also reflects the synergy model between state-owned companies to strengthen management, operational efficiency, and stability of plantation funding (Rahmady, 2022). Meanwhile, the company's legality is strengthened through the Decree The Indonesian Law and Human Rights Court is the legal basis for companies in implementing legal regulations. formal in the plantation industry because it concerns the certainty of business rights, relations industrial, as well as access to long-term financing and partnerships (Syafruddin, 2024).

The establishment of PT. ASN as a holding company for PTPN I and PTPN IV aims to manage the garden together to increase management efficiency and Rehabilitation of PTPN I's plantations in the Aceh region. Joint management is expected can be more focused, professional, sustainable, can increase the added value of assets to support national food and energy security which is the responsibility of responsibility of state-owned plantation sector companies, and in the context of restructuring and transformation PTPN Group corporation. This objective is in accordance with the opinion expressed by Asnawi et al (2024); Bangun et al (2023); and Rahmady (2022) who stated that holding can increase operational and cost efficiency, stability financing, supply chain management, and shared resource utilization thus transforming the company into a more professional, independent and competitive company global market.

3.2 Location and Administration

Geographically, PT. ASN Kebun Batu Puteh is located in two districts, namely Aceh Jaya which includes the villages of Pasie Timon, Lhok Guci, and Lhueng Gayo; while in West Aceh Regency including the villages of Karang Hampa, Peulanteu, and Simpang Teumaron. The location of PT. ASN's plantation is as shown in Figure 4.1. Based on the maps in Figure 4.1, it can be seen that the boundaries of the Right to Cultivate or HGU PT. ASN is:

- To the north it borders Lhok Guci Village and Simpang Teumaron (Aceh Jaya Regency).

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- To the east, it borders Makmue Sejahtera Gardens, Simpang VillageTeumaron (West Aceh Regency)
- To the west it borders the village of Pasie Timon (Aceh Jaya Regency)
- To the south it borders the village of Karang Hampa (Aceh Regency) West)

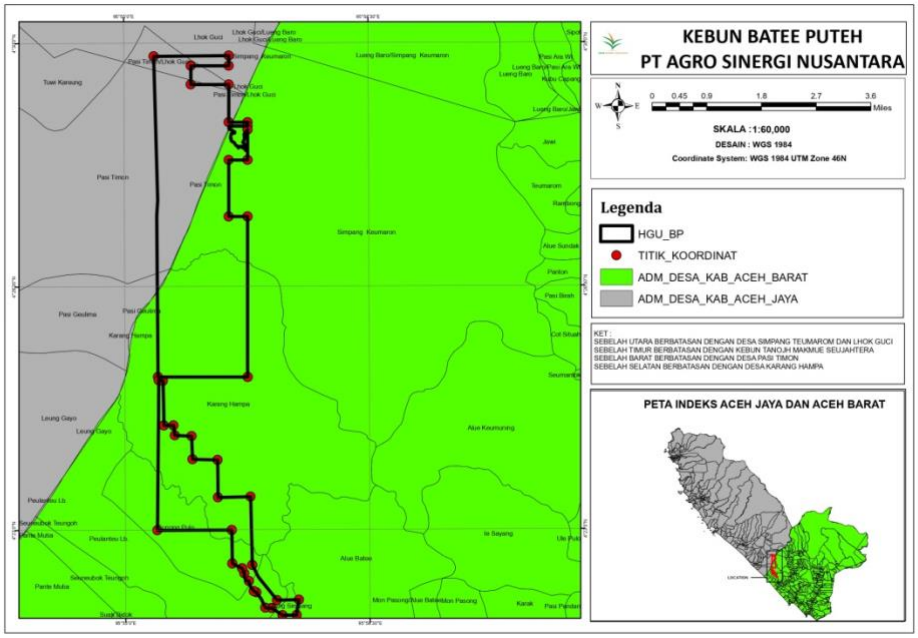

Figure 4.1. Map of PT. ASN Kebun Batee Puteh Oil Palm Plantation

Based on the maps in Figure 4.1, the boundaries of PT. ASN's Right to Cultivate (HGU) are as follows:

- To the north, it borders Lhok Guci and Simpang Teumaron Villages (Aceh Jaya Regency).
- To the east, it borders Kebun Makmue Sejahtera, Simpang Teumaron Village (West Aceh Regency).
- To the west, it borders Pasie Timon Village (Aceh Jaya Regency).
- To the south, it borders Karang Hampa Village (West Aceh Regency).

The plantation's location across two regencies requires the company to handle administrative matters in both regencies. The existence of a plantation company with land spanning two or more regencies will have complex or heterogeneous impacts. These impacts are often more complex than if the plantation were located within a single administrative area, but they must be resolved to ensure the company's operations continue to run optimally and achieve optimal profits (Sheil et al., 2009; Vos, 2016). Furthermore, Sheil et al. (2009) also explained that oil palm plantation companies with a single HGU but located in two different districts will face different problems, including: 1) Land morphology issues such as mineral and peat lands; 2) Local economic issues such as community income structure and employment; 2) Community social issues such as land conflicts and changes in livelihoods; 3) Environmental issues such as deforestation, emissions, water quality; and 4) Governance issues such as HGU legality, land rights status, local government capacity, community involvement in plantations, and land certification.

3.3 Lost Production Potential and Financial Losses

Agriculture is an endeavor that must be carried out continuously. Continuity of agricultural activities enables more effective and efficient management of natural resources, maintains soil fertility, and maintains ecosystem balance (Pretty, 2008). Without continuous implementation, agriculture will

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experience decreased productivity, increased maintenance costs, reduced production, and lost income (Todaro & Smith; 2020). In the context of institutional and regional development, sustainable agriculture will support the sustainability of the workforce, while conversely, agricultural continuity requires the availability of a workforce.

Specifically, plantation businesses based on perennial crops are highly vulnerable to conflict, as plantation crops require routine maintenance and require years of harvest. Conflicts hinder access to the plantation, disrupting agricultural operations, resulting in cumulative long-term economic losses (Brück et al., 2016). The impact of the conflict and post-conflict in Aceh, which affected the operations of the oil palm plantation of PT. ASN Kebun Batee Puteh, has resulted in the company being unable to obtain optimal production and revenue. The potential loss of production and revenue at PT. ASN or the research location is calculated in Appendices 1 and 2, and is then summarized and described in Table 4.6.

Attachments 1. and 2. show that the company has started planting crops since 2012 covering an area of 1,203 Ha, in 2013 an area of 175 Ha, in 2014 an area of 79 Ha, and in 2022 an area of 356 Ha so that the total area planted is 1,813 Ha. However, the crops that can be harvested currently are only 1,100 Ha or 60.67% of the total existing crops, the crops that can be harvested include the 2012 planting year covering an area of 974 Ha, the 2013 planting year covering an area of 70 Ha, and the 2014 planting year covering an area of 56 Ha. Meanwhile, 713 hectares of unharvested land currently consists of 258 hectares of TBM-III intercropping plants from the 2012-2014 planting year, 356 hectares of new TBM-III planting years from the 2022 planting year, and 119 hectares of rehabilitation plants from the 2012-2014 planting year. This condition indicates that the agronomic operations of the plantation or plant maintenance are not running optimally. The company should have had a TM of 1,813 hectares, but there are 713 hectares or 39.33% of plants that cannot be harvested, 721 hectares of land are still empty and operationally this will burden the company's budget.

Table 4.6. Calculation of Production Potential, Production Losses, and Business Revenue of PT. ASN

No	Uraian	Based on the Area of Producing Plants (1.100 Ha)	Based on Potential Land Area (1.813 Ha)
1	Production Potential TBS 2015-2025 (Ton)	243.668	479.117
2	Production Real TBS 2015-2025 (Ton)	54.114	58.175
3	Potential Loss of Production TBS 2015-2025 (Ton)	189.553	420.942
	Percentage of Potential Production Loss TBS (%)	77,79	87,86
4	Average Potential Production Loss TBS /year (Ton)	17.232	38.267
5	Total Potential Loss 2015-2025 (Rp. 000,-)	368.048.737	836.108.649.

Table 4.6. which is a summary of Appendices 1. and 2. shows that the oil palm plantation land of PT. ASN has the potential for suitability of S2 and S3 Land so that ideally the resulting FFB production must be in accordance with the suitability standards. Based on mature plants covering an area of 1,100 Ha during 2015-2025, the plantation has a production potential of 243,668 tons, but the harvestable production is 54,114 tons, resulting in a production loss of 189,114 tons or 77.79% of the existing production potential. With an average production loss of 17,232 tons per year, the company experienced a loss of Rp. 368,048,737,000 during the 2015-2025 period. Furthermore, if the calculation is based on a potential arable land area of 1,813 Ha, where ideally the land should have been planted with oil palms so that the potential production that should be obtained during the

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2015-2025 period is 479,117. However, the company only obtained a production of 58,175 tons with a loss of 420,942 tons or 87.86% of the existing production potential. With an average production loss of 38,267 tons per year, the company experienced a loss of Rp. 836,108,649,000 during the 2015-2025 period. Furthermore, if the loss is mapped based on the work location or plantation division, the loss mapping can be seen in Figure 4.3.

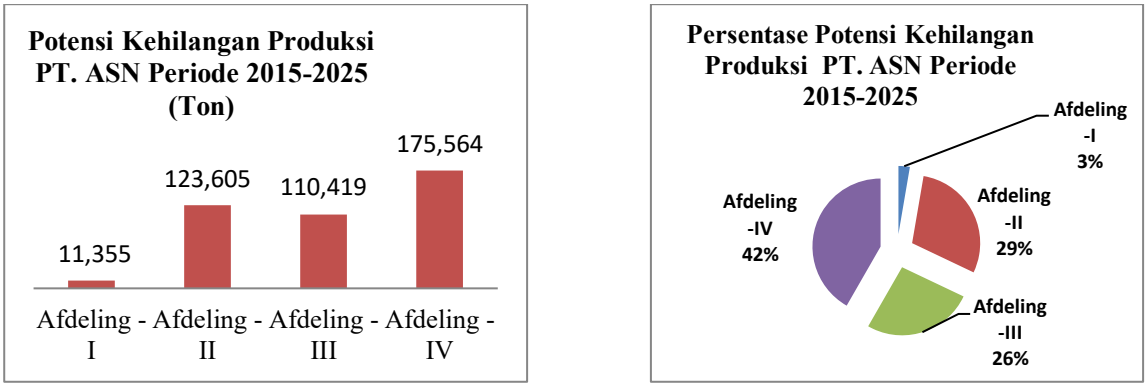

Figure 4.3. Potential Loss and Percentage of Fresh Fruit Bunch (FFB) Production PT. ASN per Division, 2015-2025

Based on the data in Appendices 1., 2. and 8 as well as Table 4.6. and Figure 4.3. shows the potential loss of PT. ASN's FFB production for the 2025-2025 period due to post-conflict. In terms of work area, Afdeling IV is the area with the greatest loss of production potential, and Afdeling I has the least loss of production potential. Afdeling I is an office and residential area so it is always under supervision, while Afdeling IV is the most peripheral area and some are still occupied by the community. The area with the highest percentage of potential loss indicates the magnitude of the problem at that location or the area that cannot be managed optimally. Companies that cannot operate optimally, especially oil palm plantations, are characterized by plant care no longer in accordance with agronomic standards, many plants are damaged or even dead, and harvests cannot be carried out so that the company will experience losses. According to George & Adelaja (2021) and Odozi & Oyelere (2021), one of the crucial issues facing palm oil plantation companies post-conflict is labor availability. The insecurity caused by the trauma of the conflict drives experienced workers or workers around the plantations to migrate or find work elsewhere, where it is relatively safer. As a result, palm oil plantations experience labor shortages, neglected plant maintenance, damaged plantations, and the inability to harvest their crops.

In addition, according to Akmal et al., (2023), the vertical conflict between GAM and NKRI not only had an impact during the conflict, but there were still other problems in the post-conflict period in the form of technical agronomic issues in the plantation, community trauma, socio-economic in the community and economic activities in the conflict location. Furthermore, Zainal et al. (2024) also stated that the conditions of conflict and post-conflict in plantation businesses, especially oil palm, also had an impact on decreased production, requiring investment in plantation rehabilitation, land disputes, conflicting recognition of land rights so that negotiations had to be carried out between the disputing parties, and adjustments to operational costs due to the degradation of plantation conditions. The various problems faced by these plantation businesses had an impact on plantation management in the form of increased operational costs, damage to plants that could not be optimally maintained, decreased production, which ultimately led to company losses.

3.4 Budget Needs for Garden Revitalization.

It is common for various business sectors, including plantations, to experience periods of decline. Revitalization can be used to improve these conditions. Essentially, revitalization is the process of

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improving or reviving a condition that has declined or is not functioning properly, thus addressing the lagging, declining, or non-functioning of an object or business (Wardani, 2018). Revitalization is carried out to restore the function, value, and condition of a place, community, or system that has declined or lost its relevance (Balsas, 2022). Related to this, the post-conflict impact of the Aceh conflict, which resulted in the suboptimal operation of PT. ASN's oil palm plantation, resulting in the company experiencing losses, necessitates revitalizing its business by utilizing all potential land for planting.

Operationally, the company has carried out plant insertion of 238 Ha, carried out new planting of 235 Ha, and carried out plant rehabilitation of 119 Ha. For these lands, there has been a settlement, but the company still has 721 Ha of former forest reserve land that can be used as oil palm plantations. Therefore, the complete plantation revitalization that the company needs to do is: 1) Making or planting this reserve land as cultivated land, the analysis of the costs of planting 721 Ha of oil palm on this reserve land is compiled in Appendices 3, 4, 5, and 6; 2) Inserting dead plants on the existing TM and TMB land so that the potential production lost due to the lack of plants can be restored when the inserted plants have become TM later, the analysis of the costs of inserting TM and TBM plants is compiled in Appendices 7. Furthermore, the calculation of the costs of new planting of reserve land and the costs of inserting TM and TBM are summarized in Table 4.7.

Table 4.7. Revitalization Costs for Oil Palm Planting PT. ASN's Dead Plant Reserves and Insertion

No	Description	Wide (Ha)	Cost (Rp./Ha)	Total cost (Rp.)
1	Land Clearing and Planting	721	28.956.000	20.877.423.000
2	Maintenance TBM-I	721	17.483.000	12.605.325.000
3	Maintenance TBM-II	721	17.729.000	12.782.478.000
4	Maintenance TBM-III	721	22.431.000	16.172.732.000
Total Biaya Penanaman Baru Lahan Cadangan		-	**86.599.000**	**62.437.957.000**
Insertion Fee TM				
	Planting Year 2012	974	18.335.782	17.859.052.000
	Planting Year 2013	70	21.113.186	1.477.923.000
	Planting Year 2014	56	19.107.143	1.070.000.000
	Amount	**1.100**	**-**	**20.406.976.000**
Insertion Fee TBM III				
	Planting Year 2012	229	29.663.803	6.793.011.000
	Planting Year 2013	105	29.163.676	3.062.186.000
	Planting Year 2014	23	25.335.348	582.713.000
	Amount	**357**	**-**	**10.437.910.000**
	Total Revitalization Cost			**93.282.843.000**

Source : PT. ASN (2025, processed)

Based on Table 4.7. in order to revitalize the plantation in utilizing the existing lands, PT. ASN needs to invest Rp. 62,437,957,000,- for new planting of 721 Ha of reserve land into oil palm plantations. In addition, plant insertion costs of Rp. 20,406,976,000,- are needed for 1,100 Ha of Mature Plants (TM) and Rp. 10,437,910,000,- for 357 Ha of Immature Plants (TBM). So the total revitalization costs required are Rp. 93,282,843,000.- As revitalization is an effort to restore the function, value, and condition of a plantation that has declined and resulted in losses (Balsas, 2022), to restore the plantation's status to a more ideal condition, the company needs to reinvest by optimally revitalizing assets, such as planting reserve land and replanting dead plants. This will, in time, restore the company's losses due to the post-conflict conditions.

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