Feasibility studies of intensively tea plantation on West Java

M I S Sule¹, S Y Siswanto ¹

¹Department of Soil Science and Land Resources, Faculty of Agriculture, Padjadjaran University, Bandung, Indonesia.
e-mail: marendaishak@gmail.com

Abstract. The activities in tea plantations throughout the 2000s until now show important conditions to be addressed. First, there was a large conversion of tea plants. The Central Bureau of Statistics noted that the conversion of tea plants reached an average of 3,000 Ha per year. Second, the quality of Indonesian tea plantation production is classified in the good quality so that it can be sold at a fairly good price. Third, conversion occurs generally in the people's tea plantations and state-owned plantations. This is inversely proportional to the privately-owned tea plantations that are growing well. This study aims to analyze how much profit obtained on tea plantations. By knowing the benefits, we will know whether the tea plantations in Indonesia are feasible or not. The results showed that at low productivity (less than 2000 Ha / year), tea plantations were no longer feasible to cultivate, in terms of both the tea production and the quality of tea.

Keywords: feasibility studies, land conversion, tea plantation, tea prices, tea production

1. Introduction
In the last 25 years, the plantation sub-sector was one of the strategic businesses and mainstays in the Indonesian economy, even during the economic crisis. Agribusiness sub-sector has a significant contribution to macroeconomic stability, growth, job creation, foreign exchange earnings from exports, and sources of raw materials for downstream agricultural products [1]. Tea plantations are one of the plantation businesses that contributed greatly to Indonesia's growth so far, until the 1990s, tea plantation businesses were no longer contribute to the economy. This is indicated by the conversion of tea plants because they are no longer considered profitable, Indonesia's ranking as an exporter of world tea is declining, and the selling price of tea is fluctuating so that tea plantations are considered no longer financially profitable [2].

On the other hand, the tea plantation business is a business which since the Dutch heritage has become one of the mainstays for the community, especially for the tea farmers. This plantation business has been able to provide increased wages for some people, build village infrastructure, and establish wider cooperation [3]. This is an irony, when the tea business became difficult to market in the 1990s, especially because the export market was limited. In this regard, the current tea plantation business profit produced on each area or block must be calculated correctly [4].

Evaluation of land suitability for the plantation provides an overview of the productivity produced by each plantation block. In general, each plantation has a different level of productivity, related to the
characteristics of the land and the quality of the land in each of the different plantation. The classification of the productivity scale and the profit obtained in each plantation is important to do with the analysis of future farming. Until now, the business analysis calculation is calculated cumulatively from the number of plantations producing divided by the company's operational needs [5]. The calculation of business analysis carried out in this study is limited to the harvesting process.

The feasibility analysis of the tea plantation business is important to determine the feasibility of an intensively managed tea plantation business. This is done because the evaluation based on land characteristics and plant productivity cannot guarantee whether the tea plantation business will benefit the company. Therefore, to find out the benefit or profit from the tea plantations, an analysis of Benefit Cost Ratio (B/C) is carried out in each unit of the observed plantation. The ratio of B/C is a comparison between the level of profits obtained with the costs incurred during the management of tea plantations. A plantation business or farming is said to be feasible and provides benefits if the B/C value is greater than (>1) [6].

2. Materials and Methods

2.1. Materials

The research was conducted at a tea plantation owned by PT. XYZ in Bandung Regency and Cianjur Regency. The research location was determined by doing a secondary analysis of tea productivity data and verification of data in the field. The results of data analysis were the locations or plantation blocks that were used as the research land units. From the results of the data analysis, the data from the plantations taken were plants with certain age, pruning age, clone type, and homogeneous treatments [7]. The financial data and capital flows were obtained from the correspondence. The respondents in this study were the financial managers, operational managers, financial staff, plantation workers, office workers, and the support workers in other facilities. The respondents were selected based on specific knowledge and expertise related to the specialization in their fields. The method of data collection was done by conducting interviews and collecting supporting data documents. This study used descriptive quantitative statistical analysis methods to analyze the cash flow, financial feasibility and sensitivity with a B/C Ratio analysis tool.

2.2. Methods

The study was conducted by analyzing B/C Ratio to find out the value of the comparison of the revenue and production costs spent. The calculation formula is that B/C Ratio = the total revenue divided by the total costs. The criteria are if B/C ratio is greater than (>1), the business produces profits so that it is feasible to run; if B/C ratio equals to (=1), the business does not make profit and does not suffer a loss; and if B/C ratio is less than (<1), the business suffers a loss so that it is not feasible to run [8].

3. Results and Discussion

Based on the results of data analysis, the need for management per each block per year was Rp. 2,360,000 (Table 1). This need was used for fertilizing, controlling plant diseases, pruning, weed control, and planting. This cost was not included in the cost of the nursery because it was limited to the age of the plant which is 20-30 years. Therefore, the cost of the nursery and land rent were not included in the expenditure component of the crop. The results of the assessment of the feasibility of the tea plantation business show that the most research land units at the study sites provide benefits which were characterized by the condition that the B/C ratio was greater than 1. At high productivity (Table 2 and 3), the profits from plantation business were higher and the average of B/C ratio was more than 2.87. With these conditions, it can be concluded that tea plantations could provide economic benefits. However, in some research land units, especially those in the low productivity condition, the B/C ratio was less than 1. Financially, the research land units at low productivity was indeed less profitable, but the presence of additional land or reserves was considered important for companies in fulfilling the export quota. Viewed in terms of land characteristics and productivity indexes, this financial feasibility assessment has been in
line with the results of the land suitability class [9]. It means that the land suitability class results from the improved land suitability criteria can describe the financial condition of an intensively managed tea plantation business.

The financial aspect assessment above was then calculated in terms of the productivity, where the price of tea is pegged at Rp. 3,000 per kg. The result was very different from the calculation in terms of the quality of tea, in which the analysis was if the value is less than 30%, the price is Rp. 3,000 per kg; 30-40% is Rp. 3,150 per kg; 40-50% is Rp. 3,300 per kg. If the value is greater than 50%, the price is Rp. 3,450 per kg. The B/C ratio was also calculated based on the quality of tea obtained at the study site. The results of the B/C ratio assessment based on the quality of tea indicated that generally all study sites were profitable, especially in the research land units with moderate and high productivity. At low productivity, the B/C ratio of the research land units was more than 0.5 and there were 2 financially profitable locations, namely blocks F-11 and F21 with B/C ratios greater than 1 [10].

Table 1. Feasibility Studies of Intensively Tea Plantation on Research Location

| No | Description | Unit | Year to |
|----|-------------|------|--------|
| A  | Manpower   |      | 21 22 23 24 25 26 27 28 29 30 |
| 1  | Land clearing | 1 Ha |        |
| 2  | Eradication of Imperata | 2 HOK |        |
| 3  | Seedling planting | 2 HOK |        |
| 4  | Weed eradication | 2 HOK | 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 |
| 5  | Fertilization | 2 HOK | 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 |
| 6  | IPPT Control | 1 HOK | 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 |
| 7  | Pruning | 1 HOK | 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 30.000 |
| 8  | Stitching | 1 HOK | - - - - - - - - - - |
| 9  | Harvest | 2 HOK | 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 |
| B  | Tools and materials | | |
| 1  | Depreciation of equipment | 500.000 500.000 500.000 500.000 500.000 500.000 500.000 500.000 500.000 500.000 |
| 2  | Fertilizer: | | |
| Urea @ Rp. 2000 | 150 kg | 300.000 300.000 300.000 300.000 300.000 300.000 300.000 300.000 300.000 300.000 |
| Phoska @ Rp. 2600 | 300 kg | 780.000 780.000 780.000 780.000 780.000 780.000 780.000 780.000 780.000 780.000 |
| Organic @1400 | 100 kg | 140.000 140.000 140.000 140.000 140.000 140.000 140.000 140.000 140.000 140.000 |
| Insecticide @Rp 400000 | 10 liter | 400.000 400.000 400.000 400.000 400.000 400.000 400.000 400.000 400.000 400.000 |
| C  | Transport | | |
|    |            | 2,360.000 | 2,360.000 | 2,360.000 | 2,360.000 | 2,360.000 | 2,360.000 | 2,360.000 | 2,360.000 | 2,360.000 | 2,360.000 |
Tabel 2. The relationship of land suitability class with B/C value for each SLP based on tea productivity

| No | Profile Code | Plantation cost 20-30 year | Produktivity (kg/ha/tahun) | Harvest sale @ Rp3000/kg | Benefit | B/C |
|----|--------------|-----------------------------|----------------------------|--------------------------|---------|-----|
|    | Low productivity |                   |                            |                          |         |     |
| 1  | Block B21    | 2.360.000                  | 1.279                      | 3.837.000                | 1.477.000 | 0.63 |
| 2  | Block B51    | 2.360.000                  | 1.435                      | 4.305.000                | 1.945.000 | 0.82 |
| 3  | Block C21    | 2.360.000                  | 1.212                      | 3.636.000                | 1.276.000 | 0.54 |
| 4  | Block F-11   | 2.360.000                  | 1.617                      | 4.851.000                | 2.491.000 | 1.06 |
| 5  | Blok F-21    | 2.360.000                  | 1.568                      | 4.704.000                | 2.344.000 | 0.99 |
| 6  | Blok H-11    | 2.360.000                  | 1.310                      | 3.930.000                | 1.570.000 | 0.67 |
| 7  | Blok S121    | 2.360.000                  | 1.396                      | 4.188.000                | 1.828.000 | 0.77 |
|    | Medium productivity |                  |                            |                          |         |     |
| 8  | Block E03B   | 2.360.000                  | 2.132                      | 6.396.000                | 4.036.000 | 1.71 |
| 9  | Block E04A   | 2.360.000                  | 2.039                      | 6.117.000                | 3.757.000 | 1.59 |
| 10 | Block E04B   | 2.360.000                  | 2.410                      | 7.230.000                | 4.870.000 | 2.06 |
| 11 | Block F09B   | 2.360.000                  | 2.297                      | 6.891.000                | 4.531.000 | 1.92 |
| 12 | Block F05    | 2.360.000                  | 2.422                      | 7.266.000                | 4.906.000 | 2.08 |
| 13 | Block S019   | 2.360.000                  | 2.514                      | 7.542.000                | 5.182.000 | 2.20 |
| 14 | Block F01A   | 2.360.000                  | 2.637                      | 7.911.000                | 5.551.000 | 2.35 |
|    | High productivity |                |                            |                          |         |     |
| 15 | Block B02B   | 2.360.000                  | 3.045                      | 9.135.000                | 6.775.000 | 2.87 |
| 16 | Block E01AJ  | 2.360.000                  | 3.494                      | 10.482.000               | 8.122.000 | 3.44 |
| 17 | Block E07B   | 2.360.000                  | 3.126                      | 9.378.000                | 7.018.000 | 2.97 |
| 18 | Block E10B   | 2.360.000                  | 3.306                      | 9.918.000                | 7.558.000 | 3.20 |
| 19 | Block E10A   | 2.360.000                  | 3.554                      | 10.662.000               | 8.302.000 | 3.52 |
| 20 | Blok F01B    | 2.360.000                  | 3.630                      | 10.890.000               | 8.530.000 | 3.61 |
| 21 | Block F03    | 2.360.000                  | 3.241                      | 9.723.000                | 7.363.000 | 3.12 |
Table 3. The relationship of land suitability class with B/C value for each SLP based on tea quality

| No | Kode Profil | Plantation cost 20-30 year | Tea quality (kg/ha/tahun) | Produktivity (kg/ha/tahun) | Harvest sale | Benefit | B/C |
|----|-------------|----------------------------|--------------------------|---------------------------|-------------|---------|-----|
| 1  | Block B21   | 2.360.000                  | 37,16                    | 1.279                     | 4.028.850   | 1.668.850 | 0,71 |
| 2  | Block B51   | 2.360.000                  | 39,44                    | 1.435                     | 4.520.250   | 2.160.250 | 0,92 |
| 3  | Block C21   | 2.360.000                  | 29,80                    | 1.212                     | 3.636.000   | 1.276.000 | 0,54 |
| 4  | Block F-11  | 2.360.000                  | 41,80                    | 1.617                     | 5.336.100   | 2.976.100 | 1,26 |
| 5  | Block F-21  | 2.360.000                  | 39,22                    | 1.568                     | 4.939.200   | 2.579.200 | 1,09 |
| 6  | Block H-11  | 2.360.000                  | 38,62                    | 1.310                     | 4.126.500   | 1.766.500 | 0,75 |
| 7  | Block S121  | 2.360.000                  | 35,18                    | 1.396                     | 4.397.400   | 2.037.400 | 0,86 |
| 8  | Block E03B  | 2.360.000                  | 46,29                    | 2.132                     | 7.035.600   | 4.675.600 | 1,98 |
| 9  | Block E04A  | 2.360.000                  | 47,63                    | 2.039                     | 6.728.700   | 4.368.700 | 1,85 |
| 10 | Block E04B  | 2.360.000                  | 50,13                    | 2.410                     | 8.314.500   | 5.954.500 | 2,52 |
| 11 | Block F09B  | 2.360.000                  | 45,75                    | 2.297                     | 7.580.100   | 5.220.100 | 2,21 |
| 12 | Block F05   | 2.360.000                  | 46,38                    | 2.422                     | 7.992.600   | 5.632.600 | 2,39 |
| 13 | Block S019  | 2.360.000                  | 43,44                    | 2.514                     | 8.296.200   | 5.936.200 | 2,52 |
| 14 | Block F01A  | 2.360.000                  | 46,00                    | 2.637                     | 8.702.100   | 6.342.100 | 2,69 |
| 15 | Block B02B  | 2.360.000                  | 46,08                    | 3.045                     | 10.048.500  | 7.688.500 | 3,26 |
| 16 | Block E01AJ | 2.360.000                  | 46,08                    | 3.494                     | 11.530.200  | 9.170.200 | 3,89 |
| 17 | Block E07B  | 2.360.000                  | 45,92                    | 3.126                     | 10.315.800  | 7.955.800 | 3,37 |
| 18 | Block E10B  | 2.360.000                  | 48,50                    | 3.306                     | 10.909.800  | 8.549.800 | 3,62 |
| 19 | Block E10A  | 2.360.000                  | 47,21                    | 3.554                     | 11.728.200  | 9.368.200 | 3,97 |
| 20 | Block F01B  | 2.360.000                  | 47,06                    | 3.630                     | 11.979.000  | 9.619.000 | 4,08 |
| 21 | Block F03   | 2.360.000                  | 47,39                    | 3.241                     | 10.695.300  | 8.335.300 | 3,53 |

4. Conclusion
The current sluggishness in tea industry development allegedly due to Indonesia failure in conducting trade transactions. The sluggishness make various institutions, which initially support the tea optimization program reduced. One of the problems that often arise in the tea industry development is the climate change / weather. Climate change considered as the cause of tea plantations land conversion [11]. From the analysis result, tea plant production not determined by rainfall and temperature but the humidity. It has significant effect on the tea production level. Optimal humidity for the tea plant is in the range of 87.2%.

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