Income analysis of coconut farming with land diversification in North Minahasa Regency

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Abstract. North Minahasa Regency is the second-largest coconut plant center in North Sulawesi, with a coconut plantation area of 44,886 ha in 2018 (North Sulawesi Province in Figures, 2018). The plantation of coconut in North Minahasa Regency is a plantation of the people traditionally managed. Less development of rejuvenation coconut plantation causes an increase in the proportion of coconut plantation that its age relatively old has been cut down because it is not productive anymore. Cutting down is causing an increase in unproductive land under the coconut tree. This land can be used to grow other plants such as corn, papaya, chilli, ginger, banana and economic plants that will increase the income of coconut’s farmer. The objective of this research is to: 1) assess and analyze the existing condition of diversification and revenue land farming coconut exists in the District of Minahasa Utara; 2) calculate and compare the income per hectare of any diversification of land farming coconuts in the District of Minahasa Utara, and 3) produce a recommendation policy that is associated with alternative types of diversification of land farming coconuts in the District of Minahasa Utara. Research result showed five types of income diversification of land, namely crop monoculture of coconut processed into copra. Crop monoculture of coconut processed into coconut grain, coconut processed into coconut grain with corn, coconut processed into coconut grain with papaya, coconut processed into coconut grain with chilli. Farming that gives the highest income is coconut processed into coconut grain with papaya.

1. Introduction

Plantations commodity is one of the commodity agriculture that has a high opportunity to develop to increase the state’s income and increase farmers’ income. One of the commodity plantations that most cultivated by farmers is coconut. Coconut plant has a high economic value because almost all parts of the plants have benefits. The most important part of this plant is the fruit. Coconut meat can be consumed directly as food or used as raw material for processing various fruit coconut products [1].

Coconut plants are not efficient in land use when cultivated in monoculture. The low price of coconut selling at the level of the farmer makes income farmers not feasible. On the other hand, the coconut plant’s level of productivity is also relatively low due to lack of maintenance. To increase the income of coconut’s farmer, one of the efforts that can be done is diversification in the diversification of plants' diversification to efficiently use land that can increase the household economic security and sustainability efforts [2]. Some advantages of the effort crop diversification horizontally between the coconut plant are the production of a coconut plant and the increased income of farmers [3]. Many farmers take advantage of the rest of the land to grow to share the kind of plant food to planting diversified horizontally.
North Sulawesi has long been recognized as one of the main coconut producing areas in Indonesia. Most of the farmers had me take advantage of the rest of the land for planting some type of food. Planting pattern of cropping diversification under a tree of coconut or in between planting coconut highly profitable, by for land in the bottom of the coconut tree can be planted with other crops [4]. In managing the farming, farmers look for profit, where costs are incurred to produce the maximal output and increase revenue.

North Minahasa Regency is the second-largest coconut plant center in North Sulawesi, with a coconut plantation area in 2018 of 44,886 ha [5]. Plantation of coconut in North Minahasa Regency is the farming with various crops worth economical as corn, papaya, chilli, ginger and plant. The objective of this research is to: 1) assess and analyze the conditions the existing condition of diversification and revenue land farming coconut exist in North Minahasa Regency; 2) to calculate and compare the income per hectare of each type of diversification of coconut farming land in North Minahasa Regency, 3) to produce the policy associated with alternative types of diversification of land farming coconuts in the North Minahasa Regency.

2. Methods

2.1. Time and Place of Research
This research was conducted for 12 months in North Minahasa Regency. The location's selection is made intentionally based on considerations rural village location that produces the most extensive crop types production.

2.2. Data Collection Method
The types of data to be collected in this study include primary data and secondary data. Primary data obtained through the giving of a questionnaire to the respondent who is a coconut’s farmer with the interview directly to farmers coconuts. Secondary data obtained from agencies related to research such as the Central Bureau of Statistics, Department of Agriculture Regional North Minahasa Regency dan literature research, and the books are related.

2.3. Sampling method
Respondents were used in the study of this includes farmers coconut in the North Minahasa Regency. In purposive sampling, subdistrict with the largest crop production under the coconut in North Minahasa Regency. Six combinations of coconut plants, namely copra monoculture, coconut grain monoculture, diversification of copra with maize, diversification of coconut grains with corn, diversification of coconut grain with papaya and diversification of coconut grain with chili.

2.4. Variable measurement
1. A general overview of respondents: Age (year), an education level (Elementary School, Junior High School, Senior High School, College), the duration of potato farming (years)
2. Basic variables
   a. Land area, which is a land area planted with potatoes (ha)
   b. The Status and ownership of land is proprietary or not proprietary
   c. The production cost of the cost of farmers incurred during the potato production process for one harvest
      • Fixed costs; Tax (Rp/yr), cost of depreciation of tools (Rp),
      • Variable cost: Labor cost (Rp/HOK), Seed (Rp/kg), Fertilizer (Rp/kg) Pesticides, (Rp/kg), Transportation (Rp/day).
   d. Total production (kg or grains/ha)
   e. The price of coconut or copra and crop under the coconut at the level of farmer (Rp/kg or grains)
3. Results and discussion

This research was conducted in North Minahasa Regency. The subdistrict chosen as the sample is the District Kauditan as a subdistrict producer of coconut grains with crops between corn and chilli pepper. The District Kalawat as a producer of copra with crop between corn and the District Dimembe as a coconut grain producer to plant between papaya.

3.1. Land tenure status

Research results showed that coconut farmers’ land ownership status in North Minahasa Regency is their land, not rent or profit-sharing.

3.1.1. Type and area of land for cultivated coconut

There are five types of farmer coconuts grown by farmers coconut, as shown in Table 4.

| No. | Type                                                                 |
|-----|----------------------------------------------------------------------|
| 1   | Coconut monoculture plants that are processed into copra             |
| 2   | Coconut monoculture plants that are processed into coconut seeds    |
| 3   | Plant of coconut that is processed into coconut grains with crops between corn |
| 4   | Plant of coconut that is processed into coconut grain to plant between papaya |
| 5   | Plant of coconut that is processed into coconut grain to plant between cayenne pepper |

In the general area of land greatly affects the number of products produced by so also affects farmers' income. Based on the research results, extensive land earned by farmers coconut varies between 0.5 to 7 hectares with an average of 1.6 Hectares to plant monocultures of copra and plants between corn, papaya, and chilli pepper varies between 0.25 to 1 Hectares.

3.2. Production, cost of production, revenue and income farmers copra per hectares per planting season

The average production costs of copra farmers can be seen in Table 5.

| No. | Type                                      | Cost (Rp/Ha) |
|-----|-------------------------------------------|--------------|
| 1   | Fixed Costs                               |              |
|     | a. Tax                                    | 118,868      |
|     | b. Shrinkage of tools                     | 10,335       |
| 2   | Variable Costs                            |              |
|     | a. Copra processing                       |              |
|     | Weeding                                   | 300,000      |
|     | Climb                                     | 520,755      |
|     | Collecting                                | 333,585      |
|     | Peel off                                  | 190,189      |
|     | Fumigation / packaging                    | 719,811      |
|     | Total Cost                                | 2,193,542    |

The average taxes were incurred by farmers copra is quite different. The tax per hectare is Rp. 118,868 per planting season. The highest cost is the fumigation, which is Rp. 719,811. The second-largest cost is the climbing fee, which is Rp. 520,755 per hectare per planting season.
Table 3. Average production, cost of production, revenue and income of copra’s farmer per hectare per planting season

| No. | Type     | Amount | Unit | Price (Rp/Unit) | Total (Rp/Ha) |
|-----|----------|--------|------|----------------|---------------|
| 1   | Production | 576    | kg   | 8,000          |               |
| 2   | Price     |        |      |                |               |
| 3   | Reception |        |      | 4,608,000      |               |
| 4   | Cost      |        |      | 2,193,542      |               |
| 5   | Income    |        |      | 2,414,458      |               |

Table 6 showed that the cost of copra production per hectare per planting season is Rp. 2,193,542, the revenue of Rp. 4,608,000 and the income of Rp. 2,414,458.

3.3. Production, cost of production, revenue and income coconut grain’s farmer per hectare

Table 7 showed that the tax per hectare is Rp. 170,323 per planting season. The most significant expense is climbing—namely Rp. 606,452. The second-largest cost is the collecting cost, which is Rp. 381,935 per hectare per planting season.

Table 4. Production Costs of Coconut Grain’s Farmers per hectare

| No. | Type                  | Cost (Rp/Ha) |
|-----|-----------------------|--------------|
| 1   | Fixed Costs           |              |
| a.  | Tax                   | 170,323      |
| b.  | Tool’s Depreciation  | 5,395        |
| 2   | Variable Costs        |              |
| a.  | Coconut grain processing: |          |
|    | Weeding               | 300,000      |
|    | Climb                 | 606,452      |
|    | Collecting            | 381,935      |
|    | Peeling               | 162,581      |
|    | Total Cost            | 1,626,685    |

Table 5. Average production, cost of production, revenue and coconut grain’s income per hectare per season planting

| No. | Type     | Amount | Unit | Price (Rp/Item) | Total (Rp/Ha) |
|-----|----------|--------|------|----------------|---------------|
| 1   | Production | 2,624  | grain | 2,000          |               |
| 2   | Price     |        |      |                |               |
| 3   | Reception |        |      | 5,248,387      |               |
| 4   | Cost      |        |      | 1,626,685      |               |
| 5   | Income    |        |      | 3,621,702      |               |

Table 8 showed that the cost of coconut grains per hectare per planting season is Rp. 1,626,685, the revenue of Rp. 5,248,387 and the income of Rp. 3,621,702.
3.4. *Production, cost of production, revenue and income coconut grain with corn’s farmer per hectare*

**Table 6.** Average production costs of coconut grain with corn’s farmers per hectare

| No. | Type                             | Cost (Rp/Ha) |
|-----|----------------------------------|--------------|
| 1   | Fixed Costs                      |              |
|     | a. Tax                           | 171,707      |
|     | b. Shrinkage of tools            | 44,232       |
| 2   | Variable Costs                   |              |
|     | a. Coconut grain processing      |              |
|     | Weeding                          | 280,000      |
|     | Climb                            | 490,732      |
|     | Collecting                       | 317,659      |
|     | Peeling                          | 245,854      |
|     | b. Corn farming                  |              |
|     | Land Processing                  | 930,000      |
|     | Weeding                          | 168,000      |
|     | Fertilization                    | 168,000      |
|     | Harvest                          | 2,010,000    |
|     | Post harvest                     | 1,800,000    |
|     | Purchase of fertilizer           | 1,249,850    |

| Total Cost | 7,876,033 |

Table 9 showed that the farm coconut grains with corn, the cost of which the biggest is the cost of maize crop farming amounting to Rp. 1,249,85 million per hectare per planting season, then the cost of corn post-harvest amounting to Rp. 1,800,000 per hectare per planting season. Table 10 shows that the income of coconut grain per hectare per season Planting is amounting to Rp. 610,732, while the income of corn is amounting to Rp. 2,794,220, so that the total income is Rp. 3,404,951.

**Table 7.** Production, cost of production, revenue and income coconut grain with corn’s farmer per hectare

| No. | Description                  | Amount Coconut Grain | Unit | amount Corn | Unit | Price (Rp / unit) | Total (Rp / Ha) |
|-----|------------------------------|----------------------|------|-------------|------|-------------------|----------------|
| 1   | Production                   | 972                  | grain | 1,680       | kg   | 2,000             | 1,944,976      |
| 2   | Price of coconut grain       |                      |      |             |      | 3,500             | 1,334,244      |
| 3   | Acceptance of coconut grains |                      |      |             |      |                   | 610,732        |
| 4   | Cost of coconut grain        |                      |      |             |      | 5,880,000         | 3,085,780      |
| 5   | Coconut grain income         |                      |      |             |      | 2,794,220         | 2,794,220      |
| 6   | Total Income                 |                      |      |             |      |                   | 3,404,951      |

Table 10 showed that the income of coconut grain per hectare per season Planting is amounting to Rp. 610,732, while the income of corn is amounting to Rp. 2,794,220, so that the total income is Rp. 3,404,951.
Table 8. Cost of production coconut grain with papaya’s farmer per hectare

| No. | Type                        | Cost (Rp/Ha) |
|-----|-----------------------------|--------------|
| 1   | Fixed Costs                |              |
|     | a. Tax                     | 65,789       |
|     | b. Shrinkage of tools      | 39,789       |
| 2   | Variable Costs             |              |
|     | a. Coconut grain processing |              |
|     | Weeding                    | 280,000      |
|     | Climb                      | 501,053      |
|     | Collecting                 | 322,526      |
|     | Peeling                    | 265,263      |
|     | b. Papaya farming          |              |
|     | Land Processing            | 418,033      |
|     | Weeding                    | 319,672      |
|     | Fertilization              | 137,705      |
|     | Harvest                    | 137,705      |
|     | Transport                  | 8,508,197    |
|     | Purchase fertilizer        | 321,311      |
|     | Total Cost                 | 11,317,044   |

Table 11 showed that the farm coconut grains with papaya, the cost of which the biggest is the cost of transporting farm papaya, amounted to Rp. 8,508,197 per hectare per season planting, then the cost of climbing coconut amounted to Rp. 503,053 per hectare per planting season.

3.5. Production, cost of production, revenue and income coconut grain with papaya’s farmer per hectare

Table 12 shows that the income of coconut grain per hectare per season planting is amounting to Rp. 533,684, while revenue papaya is amounting to Rp. 16,253,770, so that the total income is Rp. 16,789,455.

Table 9. Cost of production of coconut grain with papaya’s farmer per hectare per planting season

| No. | Description                | Amount Coconut Grain | Unit | Amount Papaya | Unit | Price (Rp / unit) | Total (Rp / Ha) |
|-----|----------------------------|----------------------|------|---------------|------|------------------|-----------------|
| 1   | Production                 | 951                  | grain| 11,287        | Fruit| 2,000            | 1,902,000       |
| 2   | Price of coconut grain     |                      |      |               |      | 2,000            |                 |
| 3   | Papaya price               |                      |      |               |      | 2,000            |                 |
| 4   | Acceptance of coconut grains |                    |      |               |      | 1,366,316        |                 |
| 5   | Cost of coconut grain      |                      |      |               |      | 1,366,316        |                 |
| 6   | Coconut grain income       |                      |      |               |      | 535,684          |                 |
| 7   | Papaya reception           |                      |      |               |      | 22,573,770       |                 |
| 8   | Papaya costs               |                      |      |               |      | 6,320,000        |                 |
| 9   | Papaya income              |                      |      |               |      | 16,253,770       |                 |
| 10  | Total Income               |                      |      |               |      | 16,789,455       |                 |
3.6. Production, cost of production, revenue and income coconut grain with chili’s farmer per hectare

Table 10. Cost of production of coconut grain with chili’s farmer per hectare per planting season

| No. | Type                      | Cost (Rp / Ha) |
|-----|---------------------------|----------------|
| 1   | Fixed Costs               |                |
|     | a. Tax                    | 112,118        |
|     | b. Tool’s depreciation    | 6,855          |
| 2   | Variable Costs            |                |
|     | a. Coconut grain processing: |            |
|     | Weeding                   | 300,000        |
|     | Climb                     | 507,368        |
|     | Collecting                | 328,000        |
|     | Peeling                   | 265,263        |
|     | b. Chili farming          |                |
|     | Land Processing           | 2,410,714      |
|     | Weeding                   | 1,150,000      |
|     | Fertilization             | 910,714        |
|     | Harvest                   | 1,110,714      |
|     | Transport                 | 2,400,000      |
|     | Purchase fertilizer       | 2,272,321      |
|     | Total Cost                | 11,774,070     |

Table 13 shows that the farm coconut grains with chilli, the cost of which the biggest is the cost of processing land chilli farming amounting to Rp. 2,410,714 per hectare per season planting, then the cost of transporting chilli amounting to Rp. 2,400,000 per hectare per growing season.

Table 11. Cost of production of coconut grain with chili’s farmer per hectare per planting season

| No. | Description     | Amount Coconut Grain | Unit | Amount Chili | Unit | Price (Rp / unit) | Total (Rp / Ha) |
|-----|-----------------|----------------------|------|--------------|------|------------------|----------------|
| 1   | Production      | 1.046                | grain| 707.4        | Kg   | 1,800            |                |
| 2   | Price of coconut grain |                |      |              |      | 20,000           |                |
| 4   | Revenue of coconut grains |            |      |              |      | 1,883,368        |                |
| 5   | Cost of coconut grain |                |      |              |      | 828,402          |                |
| 6   | Coconut grain income |                |      |              |      | 1,054,967        |                |
| 7   | Chili Revenue   |                     |      |              |      | 14,147,368       |                |
| 8   | Chili Cost      |                     |      |              |      | 3,379,464        |                |
| 9   | Chili Income    |                     |      |              |      | 10,767,904       |                |
| 10  | Total Income    |                     |      |              |      | 11,822,871       |                |

Table 14 showed that the income of coconut grain per hectare per season planting is amounting to Rp. 1,054,967, while chilli revenue is amounting to Rp. 10,767,904, so that the total income is Rp. 11,822,871.

4. Conclusion
In North Minahasa Regency, there are five types of income diversification of land, namely crop monoculture of coconut that is processed into copra, coconut grains. Plant of coconut that is processed into coconut grains with crops between corn. Plant of coconut that is processed into coconut grain to plant between papaya. Plant of coconut that is processed into coconut grain to plant between chilli. Farming that produces the highest income is coconut plant processed into coconut grain planted with papaya.
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