Analysis of income risk of credit use on Arabica coffee plants in North Sumatra

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Abstract. Capital is an important component in Arabica coffee cultivated. Capital is used to meet the costs of caring for coffee plants. Farmers in meeting the need for capital were taking loans by credit. Credit can reduce the risk of income. North Sumatra is one of the Arabica coffee producing provinces in Indonesia. Karo and Dairi Regency are high Arabica coffee producing regions in North Sumatra. The purpose of this research was to analyse the income risk of Arabica coffee credit users in North Sumatra. The research was conducted by interviewing Arabica coffee farmers in Karo and Dairi Regency. The number of respondents was 50 farmers by purposive sampling. The data were analysed by using farm analysis which was then tested by Independent Sample T-Test and risk analysis of coefficient of variation.

This research showed that there are differences in average income between credit user farmers and non-credit user farmers. The average income of credit user farmers is 22,418,482 IDR/hectare/year, while the average income of farmers who are not credit user is only 15,153,119 IDR/hectare/year. The risk of income of farmers’ credit user is smaller than farmers’ non-credit user (0.233 < 0.292).

1. Introduction
Coffee is a national plantation commodity that has high potential to be developed in improving the national economy even export. Coffee is one of the annual plants that are commercial and export-oriented which in farming activities requires large costs and large profits as well [1]. From 2010-2014, Indonesia was the third largest coffee producing country in the world with a contribution of 7.68% to total world coffee production after Brazil (33.22%) and Vietnam (14.70.), and coffee exporting countries the fourth largest in the world under Colombia with a market share of 7.41% in the world. Coffee exports can contribute to the value of Indonesia's trade reaching 1.01 billion US $ [2].

North Sumatra is Indonesia's third largest coffee producing province after Lampung and South Sumatra Provinces. In the 2013-2017 period, North Sumatra became the largest Arabica coffee producing province in Indonesia, amounting to 49.70 thousand tons of rice coffee (30.90% contribution) which was then followed by the Aceh Province with a production of 47.29 thousand tons of rice coffee (contribution of 26.29%). Arabica coffee is a type of coffee that is mostly cultivated in North Sumatra. This is due to the increasing demand for Arabica coffee and the selling price is more expensive than Robusta coffee. The increasing demand for Arabica coffee is due to the high interest of the export destination countries for this type of coffee and controls 70 percent of world market needs [2].
Capital is one of the important components in supporting coffee farming activities. Farming capital is a combination of own capital and external capital. External capital or credit can be obtained from cooperative financial institutions, commercial banks, and capital markets. Coffee is an annual plant that requires large costs in its maintenance. Farmers who do good maintenance will get high productivity compared to farmers who do not do. In general, coffee farmers have limitations in capital, so they need credit in maintaining coffee. The availability of credit by credit institutions greatly influences farmers in increasing their agricultural productivity and income [3].

Farming is a business that depends on natural conditions. These natural conditions influence farmers in the use of input factors that have risks in their use. Input factors such as the use of chemical fertilizers that are not recommended and pest attacks can cause a high chance of production failure. Production failure affects the low income received by farmers [4]. The inability of farm income to repay loans is a risk. The changing production costs and fluctuating coffee prices are risks that affect incomes of farmers. This study aims to analyse: (1) the difference in income of Arabica coffee farming obtained by farmers who use credit and not use credit in North Sumatra, (2) the level of the Arabica coffee risk income of credit user farmers and non-credit user farmers in North Sumatra.

2. Materials and methods

2.1 Location and sampling method
Location of this research was conducted by purposive or deliberate method, the district which is the centre of Arabica coffee production in North Sumatra. The locations were chosen based on the consideration that the areas had high coffee production and the majority of the population cultivated Arabica coffee and used credit, namely Karo and Dairi Regency. The population of this research were all Arabica coffee farmers whose coffee plants had produced (age ≥ 7 years), both those who took credit and those who did not take credit in Karo and Dairi Districts. Sampling was done by purposive sampling of coffee credit user farmers and non-credit users’ farmers each of 25 samples. Data collection is done by using primary data collection methods with interviews and discussions, as well as secondary data.

2.2 Farm analysis
Costs (IDR) divided into two, namely fixed costs and variable costs with equation (1), where TC (Total Cost) is the sum of Total Fixed Cost/TFC (IDR) and Total Variable Cost/TVC (IDR) [5]:

\[ TC = TFC + TVC \]  

(1)

Total farm revenue (TR, IDR) was calculated using equation (2), where Y is total output (IDR) and Py is selling price (IDR) [6]:

\[ TR = Y \times Py \]  

(2)

Income (\( \pi \), IDR) was calculated using equation (3), where TR is the total revenue (IDR), and TC is the total costs (IDR) [5]:

\[ \pi = TR - TC \]  

(3)

2.3. Coffee farming income testing
The difference in income of Arabica coffee farming between credit user farmers and non-credit user farmers is tested by the Independent Sample T-Test or T-test for the average income of two independent samples. Test criteria by using a significance level of 5%. \( H_0 \) is accepted and \( H_1 \) is rejected if \( t_{\text{count}} \leq t_{\text{table}} \) and \( H_0 \) is rejected and \( H_1 \) is accepted if \( t_{\text{count}} > t_{\text{table}} \).

The hypotheses in this study are:
H₀ = there is no difference in Arabica coffee farm income between credit user farmers and non-credit user farmers.
H₁ = there is difference in Arabica coffee farm income between credit user farmers and non-credit user farmers.

2.4. Risk analysis
The level of income risk (CV) was calculated using equation (4). The level of income risk of the coffee farmer was found out by the coefficient of variation and the lower limit of profit. The coefficient of variation (CV) is the ratio between the risk that must be borne by coffee farmers (V) with the average of profit to be obtained as a result of capital invested in the production process (E, IDR/Ha/year).

\[
CV = \frac{V}{E}
\]  
(4)

Average profitability of coffee farming (E, IDR /Ha/year) was calculated using equation (5), where Eᵢ is profit from coffee farming received by farmers (IDR/Ha/year) and n is number of coffee farmers (person).

\[
E = \frac{\sum_{i=0}^{n} E_i}{n}
\]  
(5)

Standard deviation (V) is the root of the variety with equation (6):

\[
V = \sqrt{V^2}
\]  
(6)

Analysis of variance (V²) was calculated using equation (7), where E is average profit of coffee farming (IDR/Ha/year), Eᵢ is profit of coffee farming received by farmers (IDR/Ha/year), and n is number of coffee farmers (person).

\[
V^2 = \frac{\sum_{i=1}^{n} (E_i - E)^2}{n-1}
\]  
(7)

To find out the lower limit of coffee farming profits (L, IDR/Ha/year) was using equation (8), where E is average coffee farm profit (IDR/Ha/year) and V is standard deviation of coffee farm profit.

\[
L = E - 2V
\]  
(8)

The greater the value of the CV shows that the risk that must be borne by farmers is greater. The criteria used are:

a. If the value of CV ≤ 0.5 or L ≥ 0 means that coffee farmers will always avoid losses.
b. If the value of CV > 0.5 or L < 0 means there is a chance of losses that will be suffered by coffee farmers [7].

3. Results and discussion

3.1. Farm analysis
Based on Table 1, the many uses of production factors influence the amount of income of farmers. The greater the costs incurred (fixed costs and variable costs), the higher the production and revenue obtained by farmers. Fertilizers, pesticides, herbicides, and fungicides are the highest costs incurred by farmers using credit compared to non-credit farmers, namely 5,072,419 IDR/hectare/year. The average income of farmers using credit is greater than the income of farmers not using credit with a
difference of 32.4 percent. The greater costs used, the higher productivity produced, and the greater income obtained by farmers [8].

Table 1. Analysis of average farm revenue, production costs, and farm income per hectare per year in North Sumatra

| Variable                  | Non-credit users’ farmers | Credit user farmers |
|---------------------------|---------------------------|---------------------|
| Farm revenue              | Value/Ha/Yr (IDR)         | Value/Ha/Yr (IDR)   |
|                           | 28,066,125.00             | 37,241,067.00       |
| Production cost           |                           |                     |
| a) Variable costs         |                           |                     |
| Fertilizers, pesticides, herbicides, and fungicides | 3,454,036.00 | 5,072,419.00 |
|                External family labour | 5,215,758.00 | 5,279,625.00 |
|                Labour in the family | 3,599,124.00 | 3,407,216.00 |
| b) Variable cost          |                           |                     |
| Tax / land rental         | 258,699.00                | 34,930.00           |
| Depreciation of tools / machines | 385,389.00 | 302,095.00 |
| Loan interest             | 0.00                      | 726,300.00          |
| c) Total Cost (TC)        | 12,913,006.00             | 14,822,585.00       |
| Farm income               | 15,153,119.00             | 22,418,482.00       |

3.2. Difference test

The difference in average income between credit user and non-credit user farmers, the Independent sample T-Test was conducted using the SPSS program. To see the distribution of normal data the Kolmogorov Smirnov test was carried out. Based on Table 2, can be seen that the significance value of the test is 0.079. This value is greater than the value of α (0.05), Ho is accepted and H1 is rejected. So, it can be concluded that the data entered in the Independent Sample T-Test Test is normally distributed and the data can be accepted [9].

Table 2. Kolmogorov-Smirnov normality test result

|                   | Statistic | df | Sig. |
|-------------------|-----------|----|------|
| Income coffee     | 0.118     | 48 | 0.079|

Then tested using the Independent Sample T-Test with results:

Table 3. Independent sample t-test result

|                   | T    | df | Sig. (2-tailed) |
|-------------------|------|----|----------------|
| Coffee income     | -5.299 | 48 | 0.000          |

Based on Table 3, the Sig (2-tailed) value is 0.000. This value is smaller than the value of α (0.05), it can be concluded that Ho is rejected and H1 is accepted. There is a difference in average income between farmers using credit from farmers not using credit [9].

3.3. Income risk

This research using income risk to find out of the risk income of credit user farmers and non-credit user farmers. The level of income determines about coffee farming feasibility. If production is high
and prices are low, income will be low and not feasible to be done. The risk of income between credit user farmers and non-credit user farmers is using the coefficient of variation analysis which is a comparison between the standard deviation values and the average values. The calculation of the analysis of the coefficient of variation between credit user farmers and non-credit user farmers are:

| Table 4. Risk of Arabica coffee farming income in North Sumatra |
|-----------------------------------------------|-----------------|-----------------|
| Description                     | Non-credit users’ farmers | Credit users’ farmers |
| Average (IDR)                     | 15,153,119.00     | 22,418,483.00    |
| Standard deviation (V)            | 4,429,864.500     | 5,231,929.870    |
| Variety (V²)                      | 19,623,699,480,694.00 | 27,373,090,209,540.700 |
| Coefficient of variation (CV)     | 0.292             | 0.233            |
| Lower limit (L)                   | 6,293,390.000     | 11,954,623.000   |

Based on Table 4, the coefficient value of income risk variation for credit user farmers and non-credit user farmers will always avoid losses, because CV ≤ 0.5 (0.233 and 0.292 > 0). The lower limit value (L) of coffee farm income for credit user farmers and non-credit user farmers is greater than zero (6,293,390 and 11,954,623 ≥ 0). The lower limit of credit user farmers is 11,954,623, means that the risk income or the possibility loss that farmers can experience is 11,954,623 IDR per hectare. Thus, farmers who are non-credit user, the possibility lowest income received is 6,293,390 IDR per hectare. The calculation result of Arabica coffee farm income risk shows that CV of credit user farmers is lower than CV of non-credit user farmers, then the income risk of Arabica coffee credit user farmers is lower than non-credit users’ farmers. Risks in agricultural business are always caused by climate and weather [10]. Risks in coffee farming are caused by soil conditions, weather, and crop pests. The condition of the soil and weather is the highest risk cause, so that the highest maintenance is needed as well. The size of costs spent by farmers will affect the amount of the productivity and income earned by farmers [11].

4. Conclusions
The average income of Arabica coffee credit user farmers in North Sumatra is higher than the average income of non-credit user farmers, namely has difference of 32.4 percent. There is a difference in average income between credit user farmers and non-credit user farmers. Credit user farmers receive an average income of 22,418,482 IDR/hectare/year, while farmers who were not using credit only receive an average income of 15,153,119 IDR/hectare/year. The risk of income for credit user farmers and non-credit user farmers in North Sumatra is at CV ≤ 0.5 (0.223 and 0.257) and L ≥ 0 (12,544,262 and 7,572,540), so that Arabica coffee farming always avoids losses. The comparation of income risk of credit user farmers with non-credit user farmers is that credit user farmers have a lower income risk than non-credit user farmers.

References
[1] Raharjo P 2012 Coffee, Kopi Panduan Budidaya dan Pengolahan Kopi Arabika dan Robusta [Arabica and Robusta Coffee Cultivation and Processing Guidelines] (Jakarta, Penebar Swadaya)
[2] Center for Agricultural Data and Information 2017 Outlook Kopi 2017 [Outlook of Coffee 2017] (Jakarta, Ministry of Agriculture)
[3] Ashari DH 2013 Analisis Kredit dalam Pertanian: 37 Tahun Penelitian PSEKP [Credit Analysis in Farming: 37 Years of PSEKP Research] (Jakarta, Agricultural Socio-Economic Research)
[4] Kurniati D 2012 Analisis Risiko Produksi dan Faktor-Faktor yang Mempengaruhinya pada Usahatani Jagung (Zea Mays L.) di Kecamatan Memawah Hulu Kabupaten Landak [Analysis of Production Risk and Factors Affecting it on Corn Farming (Zea Mays L.) in Memawah Hulu District Landak Regency] Jurnal Social Economic of Agriculture 3 1 60-8
[5] Soekartawi R 1995 Analisis Usahatani [Farm Analysis] (Jakarta, Universitas Indonesia Press)
[6] Agustina S 2011 Ilmu Usahatani [Farming Science] (Malang, Universitas Brawijaya Press)
[7] Hernanto F 1993 *Ilmu Usahatani [Farming Science]* (Jakarta, Penebar Swadaya)

[8] Mujiburrahmad 2011 Analisis Produktivitas Usahatani Tomat Berbasis Agroklimat [Agroclimate based Tomato Farming Productivity Analysis] *Jurnal Sains Riset* 20

[9] Ghozali I 2016 *Aplikasi Analisis Multivariat dengan Program IBM SPSS 23 [Multivariate Analysis Application with The IBM SPSS 23 Program]* (Semarang, Badan Penerbit Universitas Diponegoro)

[10] Soekartawi R, Rusmiadi, Damaijati E 1993 *Risiko dan Ketidakpastian dalam Agribisnis: Teori dan Aplikasi [Risk and Uncertainties in Agribusiness: Theory and Application]* (Jakarta, Raja Grafindo Persada)

[11] Binswanger HP and Sillers DS 1983 Risk Aversion and Credit Constraints in Farmer’s Decision *J. Dev. Stud.* 20 5-21

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