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Financial Analysis of Annual Plant-Cocoa Intercropping Farming at Kolaka Regency

Kabul Budiman¹, Campina Illa Prihantini, Hasbiadi, and Masitah

¹Faculty of Agriculture, Fisheries, And Animal Husbandry
Sembilanbelas November Kolaka University, Kolaka, South East Sulawesi, Indonesia.

E-mail: kabulbudiman1968@gmail.com; campinailla@usn.ac.id; hasbiadi@gmail.com; masitah.malla@gmail.com

Abstract.
Annual plant-cocoa intercropping farm with cocoa+coconut+patchouli (KKN), cocoa+coconut+anacardium (KKJ), cocoa+coconut+banana (KKP) pattern could minimize a risk of crop failure because intercropping plants resulted in more than one product, hence if one of commodity failed then it was expected profit from others commodity. Farmer want to minimize use of productive input and maximizes output in order to get sustainable production. Objective of the research was to know financial feasibility of annual plant-cocoa intercropping farming in various patterns. Location of the study was Kolaka Regency, with 270 respondents of 9 villages representing 3 districts. This study used random sampling method. This research used financial analysis of farming, such as benefit cost ratio (BCR), net present value (NPV), and internal rate of return (IRR) analysis. The analysis indicated that KKN farming pattern was feasible. KKN pattern had high feasibility to use because had B/C, NPV, IRR, and payback period ratio more feasible that other patterns and the financial analysis of cocoa intercropping farming was more feasible than cocoa monoculture farming.

1. Introduction
Financial analysis is a feasibility study to have farmer’s view of point as the owner. Financial analysis is seen from segment of cash-flow, namely comparison between benefit and number of total costs, as stated in present value to determine feasibility or profit of a project. Financial outcome is also often called private returns. Others that should be aware in financial analysis are time to have a return before the effected parties run their capital in development of project [1]. Agricultural development strategy currently needs to focus on agriculture that enacting an intensified, intensified and diversified agriculture. Diversified crop is one of alternative to reduce a risk of crop failure. Opportunity to do diversification is still abundant. One of them is to manage a multiple cultivation, namely base crop and tolerant plant which having an economic value. Use of the shading tree and or use of the intercropping plant which having higher economic value and right plant were form of diversified crop that feasible to do [2].

In dry land, diversified crop can only be done by a multiple cultivation pattern, in this matter the intercropping one. This pattern is one of technology to manage a cultivation in land that can reduce a risk of using dry land for agricultural development. Multiple cultivation pattern is a system of agricultural land management by combining an intensified and diversified crop [3]. In common, the
intercropping is more benefit than monoculture one because it has higher productivity of land, more varied kind of commodity, economic in use of productive utility and minimal in risk of crop failure [4], [2].

Development of cocoa commodity in general faces some problems as follows: (1) use of unstandardized seed; (2) high intensity in harmful germ attack of cocoa; (3) monoculture farming system still dominant other than the intercropping; (4) average age of cocoa more than 25 years; (5) presence of barter (or called 'ijon') system [5]. Agricultural program of integrated commodity in agricultural development is conducted by government as an effort to fulfill what done along this time. An effort of improving production need to apply an integrated agricultural system with one of pattern called as the intercropping. Kolaka Regency is a center of production in cocoa for region of South East Celebes. Risk of crop failure in cocoa still became main limitation of farming due to germ attack, climate and trend of using monoculture agricultural system [6]. Question answered in the study was: how financial feasibility of annual plant-cocoa intercropping farming did in various patterns?

Objective of the research was to know financial feasibility of annual plant-cocoa intercropping farming in various patterns. Benefit expected in the study was: to have an informational material for people to increase their income in relation to annual plant-cocoa intercropping farming. Result of the research could be used as material of information for advanced study suitable for developed paradigm of science, as material of consideration in policy to create an improvement of production and income while they used annual plant-cocoa intercropping farming pattern.

2. Materials and Methods
According to [7], [8], [5] research, they said that in financial analysis of farming, there were some criterions to use for taking a decision in relation to feasibility of an agricultural project. Criterion discounted analysis is to indicate how much benefit and cost during an economic age of project (in the future), present value (at present), as measured by present value. It was using benefit cost ratio (BCR), net present value (NPV), and internal rate of return (IRR) analysis, as described below:

2.1. B/C ratio is a comparison between income and cost as described below:

\[
BCR = \left\{ \frac{\sum_{i=1}^{t} B_t/(1+i)^t}{\sum_{i=1}^{t} C_t/(1+i)^t} \right\} \quad \quad \quad (2.1)
\]

Information:

BCR = Benefit cost ratio
Bt = benefit of income a year
Ct = benefit of cost delivered each year
t = economic age of project
i = interest level (Gittinger, 2008)

If B/C ratio > 1, then a project can be said feasible to do. If B/C ratio < 1, then the project is not feasible to do, due to have a loss.

2.2. Net Present Value (NPV)
NPV of benefit and cost flow is a difference between net value of benefit flow and net value of cost flow. Difference of cash inflow and cash outflow happening each year called by net benefit. Net benefit occurring each year is discounted by opportunity cost of capital has not rule yet in general by using present value of each net benefit occurring each year. Number of the present value net benefit will result in mathematical NPV as written in formula:

\[
NPV = \sum_{m=1}^{n} \frac{B_t - C_t}{(1+i)^t} \quad \quad \quad \quad \quad (2.2)
\]

Information:

NPV = Benefit cost ratio
Bt = Benefit of income a year
If Net Present Value (NPV) > 0 (positive), then a project can be said feasible to do of received due to have a profit. While if NPV < 0 (negative), then the project is not feasible to do. If NPV = 0, it means additional benefit of project is similar to additional cost delivered.

2.3. Internal Rate of Return (IRR)
Using net additional benefit flow or additional cash flow to measure net present value from net additional benefit flow or additional cash flow is similar to zero. The discount rate is also called Internal Rate of Return, IRR. The rate is a maximum interest rate that project pay for the used resource because the project requires fund anymore to handle operational costs and investment, as well as for new project until capital return rate [7]. Estimation of IRR based on two interest rate (i₁ and i₂), mathematically formulated as below:

\[
\text{IRR} = i_1 + \left(\frac{i_2 - i_1}{NPV_1 - NPV_2}\right) \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2.3)
\]

If IRR of a project is similar interest rate of the ruled money as social discount rate, then NPV of the project is similar to zero. If IRR of a project is lower than interest rate ruled (IRR<1), it means that the NPV is less than null (NPV<0). But if the IRR is larger than or similar to the ruled interest rate (IRR>1), it means that the NPV is higher than or similar to zero (NPV>0). In situation, IRR>1 or NPV>0, it can be associated that the project is feasible to do. Meanwhile if IRR<1 or NPV<0, then the project is not feasible to do, because the capital rate of return is less than borrowing interest rate ruled.

2.4. Payback Period (PBP)
PBP is a period that required to cover an expenditure of an investment (initial cash investment) by using net incoming cash flow (proceeds) or in other word, payback period is ratio between initial cash investment and the cash flows, in which the result is a time in unit. Then, the rate is compared to the maximum payback period that can be accepted. With PBP method, it aims to measure how long of time need to recover a capital investment from net cash flow of project operation. Shorter recovering investment cost of a project, it is better because capital return run fluently [1]. This payback method does not measure rate of profitability, but it just wants to know when capital can be recovered quickly. Net incoming cash comes from total selling value (acceptance) deducted by total cost value (expense) then deducted by tax. Therefore, PBP model is estimated as follows:

\[
Ko = \sum_{t=1}^{n} (Bt - Ct) \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2.4)
\]

Information:
Ko = Payback period
Bt = Cash inflow a year
Ct = Cash outflow a year

3. Results and Discussion
Intercropping cacao farming means cacao planted beside others in a field of land and results in more than one output. In local language, it is called “pinahomedulu”, it means that one is planted beside others in order to have more output. Production is an outcome of farmer that resulted from use of various productive factors. Use of input covers variable cost or farmer’s expense including; cattle fertilizer, urea, SP-36, KCL, herbicide, insecticide, outsourcing worker (HOK) used in productive process. Meanwhile fixed costs are investment and fixed cost depreciation.
| Description | Cocoa-Coconut-Patchouli | Cocoa-Coconut-Anacardium | Cocoa-Coconut-Banana |
|-------------|-------------------------|--------------------------|----------------------|
| Land Area   | 1.79                    | 1.69                     | 1.86                 |
| Selling     |                         |                          |                      |
| - Cocoa (Kg)| 1691.70                 | 1648.85                  | 1924.38             |
| - Coconut (Seed)| 1394.08       | 1145.38                  | 1449.47             |
| - Patchouli-Anacardium-Banana | 1967.32 | 290                      | 2465.000            |
| Revenue Total (IDR) | 37.111.407, | 22.452.735,             | 31.201.018,         |
| Initial Fee/Tax (IDR) | 662.500,      | 637.500,                  | 525.000,            |
| Cost of purchasing equipment (IDR) | 210.091,      | 244.210.86,             | 259.712,            |
| Variabel Cost |                         |                          |                      |
| - Manure (Kg) | 3230.28                 | 3430.77                  | 1699.604,           |
| - Urea Fertilizer (Kg) | 464.45      | 379.23                   | 234.360,            |
| - SP36 Fertilizer (Kg) | 284.59      | 239.23                   | 621.998,            |
| - KCL Fertilizer (Kg) | 213.17       | 227.70                   | 683.100,            |
| - Herbicide (L) | 7.23                   | 8.14                     | 1098.900,           |
| - Insecticide (L) | 7.30                  | 10.60                    | 1325.000,           |
| - Eksternal Labor (Working Days) | 16.96       | 20.30                    | 1015.000,           |
| - Internal Labor (Working Days) | 24.29       | 26.68                    | 9333.800,           |
| Total Cost (IDR) | 7.546.050,-  | 7.659.618,-             | 5.384.244,-         |
| Residual Value (IDR) | 875.650,     | 1257.350,-              | 875.565,-           |
| Benefit (IDR) | 30.441.007,-         | 16.050.466,-            | 26.692.339,-        |

Source: Primary Data Processed 2015
Production meant is output of cocoa, coconut, and patchouli in KKN pattern, cocoa, coconut, and anacardium in KKJ pattern, and cocoa, coconut and banana KKP pattern, which converted into base crop namely cocoa and stated in kilogram. Conversion meant is average price measured, it is a number of output per commodity multiplied by market price, divided by cocoa price, then getting production rate same as cocoa from that pattern. In intercropping cocoa farming with annual crop, it is so different to monoculture farming. It is due to the field of land results in three different outputs of production in the same time. Hence, for determining production rate in a field of land planted with intercropping has to combine those tree outputs. Production is one of success indicator in farming, because income of farming is greatly influenced by high production rate in order to cover all cost of production utility. Income of annual plant-cocoa intercropping farming is number of average production multiplied by selling price in market for a commodity in a pattern. Cost of production is a summation of variable cost and fixed cost (land tax and farm utility depreciation). Income of annual plant-cocoa intercropping farming subtracted total cost either in explicit or in implicit will get profit of the intercropping pattern. It is similar with [6], although only using a combination of two tree outputs.

Financial analysis of annual plant-cocoa intercropping farming at Kolaka Regency was approached by considering average size of land, production per commodity, income, variable cost, and profit for each pattern. Basically, annual plant-cocoa intercropping farming consists of investment cost and operational cost. Investment cost covers; land (per Ha between IDR 2,500,000 and IDR 15,000,000), seed and preparative cost of land, planting, maintenance in pre-crop (history cost). Depreciation cost is one of deducting cost in economic value of tool used in producing process including; depreciation in hand sprayer, mattock, machete, and sickle. Variable cost is a changing cost that farmer expenses in producing process including; cattle fertilizer, urea, SP-36, KCL, insecticide, herbicide, and use of outsourcing worker. Size of land from the tree patterns was grouped middle class ranging between 0,75 ha and 4,0 ha. Size of working land influenced on total income, after that it would become a consideration in producing process. Highest income was KKN pattern, it was due to this pattern was supported by patchouli’s dry leave price namely IDR. 4000 per kg. Hence, it would influence on the profit, B/C, NPV, IRR, and Payback period ratio. Loading highest cost was KKJ pattern, it was due to anacardium plant required much nutritious element, as well as cocoa, so use of productive input was so higher, this research is in line with [9] [10]. Worker used was those who did not come from their family or called outsourcing, because it was profitable in financial segment. Profit is total income subtracted by total implicit and explicit cost. Use of outsourcing worker was grouped low classification with average 16,96 HOK, while the use of domestic worker 24,29 HOK during a producing year for KKN pattern. Based on family load of farmer, respondent had responsibility average four person a family. It would impact on availability of worker.

The study used a financial analysis in a reason that it would be directly beneficial, when farmer would take a decision of the tree patterns, namely: KKN, KKJ, and KKP. Farmer’s decision to choose the pattern, one of them was determined by feasibility of farming coming from the tree patterns. Feasibility of a farming has been done yet by past researchers, but result of those researches level of feasibility was differed [6], [11], [12], [13]. It was due to some factors including price fluctuation, germ attack and pattern difference.

Comparison of feasibility in annual plant-cocoa intercropping farming in KKN, KKJ, and KKP pattern would be an objective of this discussion. It was expected that in Kolaka Regency it would know which pattern was feasible to do. Feasibility of annual plant-cocoa intercropping farming would be analyzed by some indicators, including: (1) Benefit-Cost Ratio (B/C Ratio), (2) Net Present Value (NPV), (3) Internal Rate of Return (IRR), and (4) Payback period. Based on Table 1.1, then result of analysis from indicators of the tree patterns was presented in Table 3.2 below.
Table 2. Financial Analysis of Annual Plant-Cocoa Intercropping Farming at Kolaka Regency

| Farming Pattern | NPV (IDR)       | IRR (%)  | B/C Ratio | Payback Period (year) |
|-----------------|-----------------|----------|-----------|-----------------------|
| KKN             | 68,191,434,18   | 66,33    | 2,44      | 8                     |
| KKJ             | 24,848,834,26   | 61,39    | 1,69      | 11                    |
| KKP             | 65,926,040,06   | 66,57    | 2,71      | 8                     |

Source: Primary Data taken in 2015

NPV is an appraisal method in which benefit flow and cost is a difference between net value of benefit flow and one of cost flow in annual plant-cocoa intercropping farming. Result of analysis indicated that discount factor was 13 %, obtained from NPV of each patterns as follows: (1) KKN was IDR 68,191,434,18 higher than null, it meant that this pattern was feasible to do, (2) KKJ was IDR 24,848,834,26, higher than null, it meant that this pattern was feasible to do, (3) KKP was IDR 65,926,040,06, higher than null, it meant that this pattern was feasible to do. In this analysis, it was obtained net present value > 0 (positive) therefore the three patterns were feasible (benefit/profitable). The results of [14] research showed that cacao side grafting farming income in the village of Bonehau Salutiiwo, Mamuju District was IDR 18,262,574 per Ha.

Analysis above indicated that KKN, KKJ, and KKP patterns with NPV were more than one and feasible to do. Therefore, this study was similar to [6]. NPV of annual plant-cocoa intercropping farming in Kolaka Regency was still feasible to do, though it happened in price fluctuation, germ attack, and pattern difference. That was also stated by [15].

IRR could be a criterion to show how far IRR of a project could recover in given bank interest. It meant that IRR was a baseline in what the project could give a capital return that invested. Result of analysis in annual plant-cocoa intercropping farming of the tree patterns namely; KKN, KKJ, and KKP with interest rate 13 % IRR was as follows: (1) KKN was 66,33%, (2) KKJ was 61,39%, (1) KKP was 66,57 %. The tree pattern of cocoa intercropping farming indicated that this pattern was feasible to do because it had IRR, higher than interest rate ruled.

Based on analysis above, it indicated that KKP pattern with higher IRR was more feasible to do than other. But other patterns were also feasible to do for anticipating risk of farmer. IRR reached if assuming that bank interest rate ruled was 13%, after that annual plant-cocoa intercropping farming at Kolaka Regency was still feasible to do. According to [16], cocoa farming at District Tirawuta of Kolaka Regency had potency to develop. It could be seen from a comparison between income or profit value and producing cost. Considering the criterion of IRR, cocoa farming at Kolaka Regency was financially feasible to do, as well as it was suitable to do as main job that could be a basic income of farmer.

B/C ratio is a comparison between benefit and cost, by seeing bank interest rate ruled in Indonesia between 12% and 15% [5] [17]. Assuming that present interest rate was 13 %, then result of analysis in production age 20 year was as follows; (1) KKN was 2,44 higher than 1, it meant that each IDR 1,00 invested would result in income about IDR. 2,447 therefore this pattern was feasible; (2) KKJ was 1,69 higher than 1, it meant that each IDR 1,00 invested would result in income about IDR. 1,69 therefore this pattern was feasible; (3) KKP was 2,71 higher than 1, it means that each IDR 1,00 invested would result in income about IDR 2,71 therefore this pattern was feasible to do.

Based on analysis above, it indicated that KKP pattern was higher than B/C ratio and feasible to compare with the others. According to study [6] B/C ratio of cocoa intercropping farming was between 1,36 and 3,36. Then this study was paralleled with previous research in which B/C ratio of annual plant-cocoa intercropping farming was still feasible. But there was a difference of study conducted, namely presence of price fluctuation, germ attack and pattern difference.

Payback Period is time running along net cash flow to be able to recover all costs and investment cost. If NPV>0, then it was newly estimated payback period. Result of estimation indicated that payback period of investment for KKN pattern was 8 year, KKJ 11 years, and KKP 8 years after
planting time. Based on estimation above, it indicated that both KKN and KKP with payback period of investment were lower than the year stated, so it is more feasible to do other than KKJ pattern. As a comparison, economic analysis of the treatments showed that intercropping was profitable. Higher net benefits were achieved where the combinations contained plantain and maize [18].

4. Conclusion

Based on result of analysis in annual plant-cocoa intercropping farming with cocoa+coconut+patchouli (KKN), cocoa+coconut+anacardium (KKJ), cocoa+coconut+banana (KKP) pattern, it indicated that KKN pattern with B/C, NPV, IRR, and payback period ratio was feasible. Therefore, the study could inform to farmer of KKN pattern had high feasibility to do. However, it conducted to keep a sustainability of KKP pattern from annual plant-cocoa intercropping farming at Kolaka Regency. Also, it was feasible to do though it worked at price fluctuation, germ attack, and different pattern. The financial analysis of cocoa intercropping farming is more feasible than cocoa monoculture farming.

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