Analysis of Income and Feasibility of Rice-Cattle Integration System Farming Based on Enterprises Scale

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Abstract: - The research focus on the income and feasibility of rice-cattle integration system farming (RCIS). This research is based on by integrated agricultural development which seeks to optimize the use of natural resources, use of advanced technology that is cheap, simple and effective. RCIS is an agricultural system that integrates rice plants with cattle that have reciprocal relationships, rice plants provide straw and bran as cattle and cattle feed to produce feces as organic fertilizer for rice plants, so as to increase farmers' production, productivity and income. The study problems is not yet knowing how much RCIS farming income and how feasible the RCIS farming. The study objectives is to analyze the income of RCIS farming and analyze the feasibility of RCIS farming. The results showed that the income of small scale RCIS farming is IDR 17,632,028.26 with the cost of IDR 66,517,698.87; the income of medium scale RCIS farming is IDR 65,262,188.76 with the costs IDR 227,456,631.75 and the income of large scale RCIS farming is IDR 400,664,027.31 at a cost of Rp. 906,854,272.69. So that the greater the scale enterprises of the RCIS farming, the greater the RCIS farming income. The R/C ratio value of small scale RCIS farming is 1.26 with a profit rate of 26.01%, the R/C ratio value of medium scale RCIS farming is 1.29 with a profit rate of 28.96%; and the R/C ratio value of large scale RCIS farming is 1.44 with a profit rate of 44.18%. So that the greater the scale enterprises of the RCIS farming, the more feasible RCIS farming. The study conclusion is the greater the scale enterprises of the RCIS farming, the greater the RCIS income and the more feasible RCIS farming.

Key-Words*:* Analysis, Income, Feasibility, Integration, Rice, Cattle

Introduction

Agricultural development is a process of change towards a better direction in the agricultural sector [1]. Technology that is always changing more advanced is one of the absolute requirements of agricultural development [2]. Integrated agricultural development seeks to optimize the use of natural resources, use of cheaply modern technology, simple and effective [3].

Integrated farming system (IFS) is an agricultural system that combines two or more fields of agriculture [4]-[9], where input-output linkages between commodities occur and experience a biological recycling process [10], [11], [7], [12], which use input from outside low [13]-[16] and efficient use of resources [17]-[19], and applying various techniques so as to increase production, productivity and farmers' income and sustainability ([20]-[21], [12]. One model of IFS is a Rice-Cattle Integration System (RCIS) farming.

RCIS is an integrated farming system between rice plants and cattle that they have a close relationship in the utilization of waste through the natural process of nutrients recycling. Rice plants provide the rice straw which useful as feed for cattle and cattle provide feses that useful as fertilizer for rice plants [22]. RCIS is an alternative in increase production and increase farmers income, can support the provision of organic fertilizer from manure, increase the efficiency of chemical fertilizer usage and absorption of C elements and increase agricultural productivity [23]-[27].

RCIS is an agricultural system that integrates rice plants with cattle where there are reciprocal relationships. Rice plants provide straw and bran as feed for cattle and cattle produce manure that is useful as organic fertilizer for rice plants, so that it can increase the production and productivity of rice and cattle and can increase farmers' income [28].

The scale of business is the size of the land cultivated by a farm which greatly determines the level of production and income of the farm to be obtained [29]. The scale of enterprises needs to be considered by farmers because the scale of enterprises is very decisive in achieving maximum business profits [30]-[31]. The scale of enterprises is expected to be a solution in the development of RCIS farming both from the economic, socio-cultural, environmental and technical aspects. [32]Sayogyo (1977) grouped farmers in Java into three categories, such: small-scale farmers with farmland area <0.5 ha,

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medium scale with farmland area 0.5-1.0 ha, and wide-scale farmland area. > 1, 0 ha. The scale of beef cattle business consists of three groups, namely: small scale has 1-5 cows, medium scale has 6-10 cows, and large scale has cows > 10 cows [33]-[34].

Based on the study background above, the problems in this study are The study problems is not yet knowing how much RCIS farming income and how feasible the RCIS farming. The study objectives is to analyze the income of RCIS farming and analyze the feasibility of RCIS farming.

Literature Review

IFS is an agricultural system that combines various plants and livestock and the application of various techniques to protect the environment and increase land productivity and farmer income [35], where input-output linkages between commodities occur, production activities with pre and post-production, and agriculture with manufacturing and services [36]. IFS is an agro-ecotechnology system consisting of various interrelated components, namely: non-agriculture, bio-physical nature, socio-economic, political and cultural [10], with a low external input approach [14]-[16]. So that it can increase production, productivity and farmers income [20]-[21]; [12].

RCIS is an integrated farming system between rice and cattle that they have a close relationship in terms of utilization of waste through natural processes of nutrient recycling that occur between rice and cattle. Rice provide rice straw which is useful as feed for cattle and cattle provide feces which is useful as fertilizer for rice plants [22]. RCIS is an agricultural system that combines rice and cattle that synergize with each other to create biological recycling, so that they can complement each other where output from one component becomes input for the other components [37]-[38] RCIS can support the provision of organic fertilizer from manure, increase the efficiency of chemical fertilizers and absorption of C elements, and increase agricultural productivity [24]-[27]. RCIS is a system that can increase income quite high [39]. RCIS is an agricultural system that integrates rice with cattle where there is a reciprocal relationship, rice plants provide straw as cattle feed and cattle produce manure as organic fertilizer for rice, so that it can increase production, productivity and farmers income [28].

The revenue is the multiplication between farm production obtained with the received selling price on the ending time of production process. The revenue is the production value produced by a farming, the greater the production, the greater the revenue, and vice versa the lower the production, the lower the recipient, but the high income does not guarantee the high income earned [40].

Farming costs are classified into two kinnds, namely fixed costs and variable costs. Fixed costs are relatively fixed costs in number and continue to be issued even though production is obtained a lot or a little, examples of fixed costs include: taxes, land rent, agricultural equipment, and irrigation fees. Variable costs are costs that are influenced by the production obtained, for example: costs of means of production, labor and harvest [40].

Farming income is the difference between total revenue and total costs. Income analysis is useful to describe the current condition and future condition of farming activities. Income analysis provides assistance to describe farming activities that are successful or not. To determine the farming feasibility is done by using the analysis of R/C Ratio and Profitability [41].

Research Methodology

This study use descriptive research methods. Descriptive research is research that only describes and summarizes various conditions, situations or various variables. Survey research is a study conducted on large and small populations, the data studied is taken from the population so that relative events, distribution and relationships between variables can be found. Survey research focuses more on determining information about variables than information [42].

Place and Time of Research

This research was conducted in Lima Puluh Kota Regency. Determination of the Sub-district as the location of the study was conducted by purposive method [43]. Three Sub-districts were chosen, namely Payakumbuh Sub-district, Guguak and Harau Sub-districts on the basis of consideration: (1) Selected sub-districts were the centers of rice production which were carried out integrally in the Lima Puluh Kota District; (2) Selected sub-districts have never conducted research on the same topic. The study was conducted for 3 months, namely, in May until July 2018.

Sampling Method

The method of determining the sample used is the snow ball sampling method. This sampling method was used because of the unavailability of population number data so that it is not possible to create a sample frame. With this method, the first stage, researcher look for respondents who fit the criteria set, then from this respondent will appoint or

invite other friends to be sampled, and so on until the number of samples considered by the researcher has represented representative to answer the research objectives. Therefore, the number of samples in this study cannot be determined on the start of the study [44]-[45]. The Snow ball sampling technique is used when researchers have difficulty finding or identifying populations and their numbers cannot be clearly determined [46]-[48]. The snowball sampling technique is a sampling method in which samples are obtained through a rolling process from one respondent to another [49].

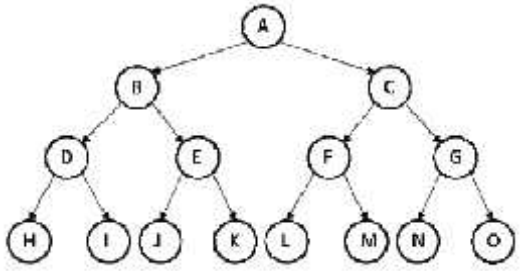

Figure 1. Chart of Snowball Sampling Techniques

The farmers' samples consist of: farmers who raise cattle (own-owned, owned by investors), and those farmers are also rice farmers (own-owned, owned by investors and pawns). The number of samples used in this study were 100 respondents of RCIS farmers. The unit of analysis in this study is a unit of SIPT farming family of farmers and farmers in farmer groups.

Method of Collecting Data

The type of data consists of primary and secondary data. The type of primary data is data derived from information obtained directly from the respondent's farmers by means of interviews, observation, and documentation conducted in three sub-districts in the Lima Puluh Kota district. Primary data consists of: rice seeds, manure, compost, inorganic fertilizers, pesticides, forage feed, straw feed, concentrate feed, worm medicine, vitamins, lice medicine, wound medicine, bran, oil palm cake, cassava, minerals, tricodherma, lime, sawdust and husk ash and the price of each input. While secondary data is data originating from relevant institutions and agencies, such as: Central Statistics Agency, Profile of Nagari and scientific works that support research.

Data Analysis Method

To analyze SIPT farming income based on business scale, quantitative analysis is used by using farm income analysis, RCIS farm income analysis using farm income formula. Farming income is the difference between total revenue and total costs. Mathematically the analysis of farm income can be formulated as follows: [41].

$Pd = TR - TC$
$TR = Y \times Py$
$TC = FC + VC$

Notes: Pd: Farming Income
TR: Total Revenue
TC: Total Cost
FC: Fixed costs
VC: Variable Cost
Y : Farming Production
Py : Price of product Y

Whereas to determine the RCIS farming feasibility is carried out by using R/C Ratio and Profitability analysis. According to [41] to assess the farming feasibility in one season or seasonly, it can use the analysis of R/C Ratio and Profitability. Mathematically it can be written as follows:

Analysis of R/C Ratio

$$\text{R/C ratio} = \frac{TR}{TC}$$

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Notes: R/C > 1, RCIS farming is profitable and worth trying
R/C = 1, RCIS farming is break even (no profit and no loss).

Analysis Profitabiliy = $\frac{TR-TC}{TC} x\ 100$

Results and Discussion

Income Analysis Of Small Scale Rcis Farming

Based on the primary data from the survey results, tabulation and data processing, it can be explained about the income conditions of small-scale RCIS farming in Lima Puluh Kota Regency, presented in Table 1.

Table 1. Income analysis of Small Scale RCIS farming

No	ANALYSIS COMPONENT	INTEGRATION (IDR 0,000)	RICE (IDR 0,000)	CATTLE (IDR 0,000)
A	PRODUCTION MEANS			
1	Rice Seed	294.32	294.32	0
2	Organic Fertilizer	0	321.37	0
3	Anorganic Fertilizer	906.78	906.78	0
4	Pesticide	206.66	206.66	0
5	Calf cattle	34,794.52	0	34,794.52
6	Feed	10,159.04	0	13,813.77
7	Drugs	31.916,67	0	31.916,67
	TOTAL A	**46,393.25**	**1,729.15**	**48,640.20**
B	EQUIPMENT			
1	Cages and equipment	70.34	0	70.34
	TOTAL B	**70.34**	**0**	**70.34**
C	LABOR			
1	Rice Farming	17,422.50	17,422.50	0
2	Cattle Rising	2,631.60	0	2,631.60
3	Making compost	0	0	0
	TOTAL C	**20,054.11**	**17,422.50**	**2,631.60**
	TOTAL (A+B+C)	**66,517.67**	**19,151.65**	**51,342.15**
D	REVENUE			
1	Rice Revenue	22,981.34	22,981.34	
2	Cattle Revenue	37,849.32	0	37,849.32
3	Calf Revenue	21,575.34	0	21,575.34
4	Manure Revenue	1,743.734	0	1,743.74
	TOTAL (IDR)	84,149.73	22,981.34	61,168.39
	TOTAL INCOME (IDR)	17,632.03	3,829.69	9,826.24
	R/C ratio	1.26	1.20	1.19
	Profitability	26.51	20.00	19,14

Based on Table 1 above, it can be explained that the total costs incurred by small scale RCIS farmers are IDR 66,517,698.87, which consists of production facilities costs are IDR 46,393,250.60, equipment costs are IDR 70,341.05 and labor costs are IDR 20,054,107.22. Total revenue obtained is IDR 84,149,727.12. Thus the total income earned by small-scale RCIS farmers are IDR 17,632,028.26. The additional contribution of RCIS farming receipts was obtained from the sale of cow feces manure (organic fertilizer), while the cattle farm income was partially lower because there was no addition from the sale of organic fertilizer.

The feasibility of small-scale RCIS farming is shown by the value of the R/C ratio and the value of the profitability. The R/C ratio obtained is 1.26. The profitability obtained is 26.01 %. The amount of the R/C ratio obtained is greater than one (R/C ratio > 1). This means that every rupiah issued by a RCIS farmer is IDR 1.00, the farmer will get an income are IDR 0.26 or 26.01 %. The condition of the R/C ratio and the profitability obtained shows that RCIS farming is feasible because the profitability is higher than the prevailing bank interest rate.

Based on the results of the above income analysis, it can be concluded that RCIS farming is more feasible compared to monoculture farming both ushatani rice crops and cattle farming. It is clear that the income obtained by implementing

RCIS farming has increased. The increase in income from 17.22 - 20.00 % increased to 26.01 % in other words experiencing an increase in profits of 6-9 %.

Income Analysis of Medium Scale RCIS Farming

Based on the primary data obtained from the survey results, tabulation and data processing, it can be explained about the conditions of farming income and the feasibility of RCIS farming on a medium scale in Lima Puluh Kota Regency, presented in Table 2.

Table 2. Income Analysis of Medum Scale RCIS Farming

No	ANALYSIS COMPONENT	INTEGRATION (IDR 0,000)	RICE (IDR 0,000)	CATTLE (IDR 0,000)
A	PRODUCTION MEANS			
1	Rice Seed	623.38	623.38	0
2	Organic Fertilizer	0	2,619.23	0
3	Anorganic Fertilizer	1,949.50	1,949.50	0
4	Pesticide	310.00	310.00	0
5	Calf cattle	103.60	0	103.60
6	Feed	52,092.63		52,092.63
7	Drugs	103.97	0	103.97
8	Compost materil	2,652.97	0	2,652.97
9	Fermented Straw material	690.33	0	0
	TOTAL A	**162,361.79**	**5,502.11**	**168,528.94**
B	EQUIPMENT			
1	Cages and equipment	364.83	0	364.83
2	Compost house and equipment	305.49	0	305.49
3	Fermented Straw House and Equipment	79.50	0	0
	TOTAL B	**749.83**	**0**	**670.33**
C	LABOR			
1	Rice Farming	44,055.73	44,055.73	0
2	Cattle Rising	9,713.53	0	9,713.53
3	Making compost	10,914.75	0	10,914.75
	TOTAL C	**64,684.01**	**44,055.73**	**20,628.28**
	TOTAL (A+B+C)	**226,795.63**	**49,557.61**	**189,827.55**
1	Rice Revenue	58,305.60	58,305.60	0
2	Cattle Revenue	116,400.00	0	116,400.00
3	Calf Revenue	83,866.67	0	83,866.67
4	Manure Revenue	4,911.55	0	4,911.55
5	Compost Revenue	29,235.00	0	29,235.00
	TOTAL (IDR)	292,718.82	58,305.60	234,413.22
	TOTAL INCOME (IDR)	65,262.19	8,747.76	44,585.67
	R/C ratio	1.29	1.18	1.23
	Profitability	28.69	17.65	23.49

Table 2 shows that the total costs incurred by the farmers of small scale RCIS are IDR 226,795,631.80, which consists of production facilities costs are IDR 162,361,791.65, equipment costs are IDR 749,826.17 and labor costs are IDR 64,684,013.93. While the total revenue obtained was IDR 292,718,820.51. Thus the total income obtained by the farmers of medium scale RCIS are IDR 65,262,188.76. The additional contribution of RCIS farmers revenue was obtained from

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the sale of organic fertilizer in the form of manure and compost, while the income of cattle farming was partially lower because there was no addition from the sale of organic fertilizer.

The feasibility of medium-scale RCIS farming is shown by the value of the R/C ratio and the value of the profitability. The R/C ratio obtained is 1.29. The profitability obtained is 28.69%. The amount of the R/C ratio obtained is greater than one (R/C ratio > 1). This means that every rupiah issued by a RCIS farmer is IDR 1.00, the farmer will receive an income are IDR 0.29 or 28.69 %. The condition of the R/C ratio and the profitability indicates that RCIS farming is feasible because the profitability is higher than the prevailing bank interest rate.

Based on the income analysis results above, it can be concluded that RCIS farming is more feasible compared to monoculture farming both rice farming and cattle farming. It is clear that the income obtained by implementing RCIS farming has increased. The increase in revenue from 17.65-23.49 % increased to 28.69% in other words experiencing an increase in profits of 5.20 - 11.04%.

The value of profitability is 28.69 % obtained on medium scale RCIS farming shows a higher number than the profitability from small scale RCIS farming which is only 26.01 %. This condition shows that medium scale RCIS farming is more feasible compared to small scale RCIS farming.

Income Analysis of Large Scale RCIS Farming

Based on the primary data from the survey results, tabulation and processing of data, it can be explained about the income conditions and feasibility of large scale RCIS farming, presented in Table 3.

Table 3. Income Analysis of Large Scale RCIS Farming

No	ANALYSIS COMPONENT	INTEGRATION (IDR 0,000)	RICE (IDR 0,000)	CATTLE (IDR 0,000)
A	PRODUCTION MEANS			
1	Rice Seed	3,504.13	3,504.13	0
2	Organic Fertilizer	0	16,155.00	0
3	Anorganic Fertilizer	8,753.75	8,753.75	0
4	Pesticide	6,546.00	6,546.00	0
5	Calf cattle	394,666.67	0	394,666.67
6	Feed	95,727.29	0	213,020.00
7	Drugs	696.23	0	696.23
8	Compost materil	11,004.91	0	11,004.91
9	Fermented Straw material	47,387.53	0	0
	TOTAL A	568,286.50	34,958.88	619,387.81
B	EQUIPMENT			
1	Cages and equipment	8,440.53	0	8,440.53
2	Compost house and equipment	921.29	0	921.29
3	Fermented Straw House and Equipment	257.05	0	0
	TOTAL B	9,618.87	0	9,361.82
C	LABOR			
1	Rice Farming	275,770.08	275,770.08	0
2	Cattle Rising	42,261.26	0	42,261.26
3	Making compost	10,917.56	0	10,917.56
	TOTAL C	328,948.90	275,770.08	53,178.82
	TOTAL COST (A+B+C)	906,854.27	310,728.95	681,928.45
D	REVENUE			
1	Rice Revenue	39,040.94	392,040.94	0
2	Cattle Revenue	558,750.00	0	558,750.00
3	Calf Revenue	257,875.00	0	257,875.00
4	Manure Revenue	18,457.31	0	18,457.31
5	Compost Revenue	80,395.05	0	80,395.05
	TOTAL REVENUE (IDR)	1,307.52	392,040.94	915,477.36
	TOTAL INCOME (IDR)	400,664.03	81,311.99	233,548.91
	R/C ratio	1.44	1.26	1.34
	Profitability	44.18	26.17	34.25

Table 3 above shows that the total costs incurred by the farmers of large scale RCIS are IDR 906,854,272.69, which consists of production facilities costs are IDR 568,286,504.37, equipment costs are IDR 9,618,867.16 and labor costs are IDR 328,948,901.15. While the total revenue obtained is IDR 1,307,518,300.00. Thus the total income earned by the farmers large scale RCIS are IDR 400,664,027.31. The additional contribution of SIPT farming revenue was obtained from the sale of organic fertilizer in the form of manure and cattle feces compost, while the cattle income was partially lower because there was no addition from the sale of organic fertilizer.

The feasibility of small-scale RCIS farming is shown by the value of the R/C ratio and the value of the profitability. The R/C ratio obtained is 1.44. The profitability value obtained is 44.18 %. The amount of the R/C ratio obtained is greater than one (R/C ratio > 1). This means that every rupiah issued by the RCIS farmer is IDR 1.00, the farmer will get an income are IDR 0.44 or 44.18 %. The condition of the R/C ratio and the The profitability value obtained shows that RCIS farming is feasible because the The profitability value is higher than the prevailing bank interest rate.

Based on the results of the above income analysis, it can be concluded that RCIS farming is more feasible compared to monoculture farming both rice farming and cattle farming. It is clear that the income obtained by implementing RCIS farming has increased. Increased income from 26.17 - 34.25 % increased to 44.18 % in other words experiencing an increase in profits of 9.93 - 18.01 %.

The value of the profit rate of 44.18 % obtained on large-scale RCIS farming shows a higher number than the profit rate of medium scale RCIS farming which is only 28.69 and small scale RCIS farming is only 26.01%. This condition shows that large scale RCIS farming is more feasible compared to medium scale RCIS farming and small scale RCIS farming.

Conclusion

The income of small scale RCIS farming is IDR 17,632,028.26 with the cost of IDR 66,517,698.87; the income of medium scale RCIS farming is Rp. 65,262,188.76 with the costs Rp. 227,456,631.75 and the income of large scale RCIS farming is IDR 400,664,027.31 at a cost of Rp. 906,854,272.69. So that the greater the scale enterprises of the RCIS farming, the greater the RCIS farming income.

The R/C ratio value of small scale RCIS farming is 1.26 with a profit rate of 26.01%, the R/C ratio value of medium scale RCIS farming is 1.29 with a profit rate of 28.96%; and the R/C ratio value of large scale RCIS farming is 1.44 with a profit rate of 44.18%. So that the greater the scale enterprises of the RCIS farming, the more feasible RCIS farming.

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