INCOME OF FARMERS APPLYING AN INTEGRATED CORN, LOWLAND RICE, AND BEEF CATTLE FARMING SYSTEM IN BONE BOLANGO

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ABSTRACT

This study aims to analyze: 1) optimal farming production on the integration system of corn, lowland rice, and beef cattle in Bone Bolango Regency, 2) determine the allocation of resources in optimal farming production system integration of corn, lowland rice and beef cattle in Bone Regency Bolango. The research method used is a survey method based on primary data and secondary data. The sample collection technique was carried out to all farmers who applied the integration system of food crops (rice-corn) and beef cattle, totaling 5 people. Analysis of the data used is linear program analysis. The results of the study stated that the optimal farm production at the farmer and regional level shows the optimal solution for farming lowland rice, corn, and beef cattle. The allocation of resources in optimal farm production at the farmer level, labor and land in lowland rice and corn farming has excess capacity or resources that are not scarce, namely 256.65 HOK and 0.3 Ha, in contrast to the allocation of factor input resources in lowland rice and corn farming where the allocation of the resources used are quite optimal because the resources they have are used up for farming activities. Resource allocation for optimal farming production at the regional level. Where the workforce has an excess capacity of 256.7 HOK, the capacity to accommodate livestock and land in lowland rice and corn farming, the allocation of resources used is quite optimal because the available resources are used up for farming activities.

Keywords: *Optimization, Farming, Integration*

INTRODUCTION

Community economic empowerment by developing a farming system, by its very nature, aims to elevate farmer incomes. It is aligned with the national development targets, one of which elevating community life rates through income growth. And yet, on the other hand, farming managed by farmers frequently has to confront diverse development challenges. Resource constraint constitutes the characteristic of farming in developing countries, including Indonesia. Limited authorization of land, capital, and other production inputs, and low managerial capabilities, are conditions which breed inefficient production. An enforceable attempt to sustain farming existences and maintain/enhance farmer income stability is developing an integrated farming system. A farming system makes up a concept of agricultural development which regards farming as a system. The system demonstrates that diverse farming branches run by farmers connect and interact with each other. The connection and interaction exist in the use of input and output levels engendered. As such, farmers should be

able to combine varied farming branches, which will thus create a mutualist symbiosis.

An integrated system is the implementation of integrated farming using a low-external input approach to cattle and plants. This system brings various advantages as cattle can use grass and greens, i.e., wild plants, straws, or agricultural wastes as food, and is able to generate cattle waste as organic fertilizer which escalate soil fertility. This system can also increase household income.

This research aims to analyze the income of farmers applying an integrated corn, lowland rice, and beef cattle farming system in Bone Bolango.

LITERATURE REVIEW

Optimization

According to Winardi (2014), optimization, from the business perspective, is a process of achieving a goal. Optimization is an effort made to optimize an activity to acquire the benefits expected. As such, optimization can only be embodied with an effective and efficient embodiment.

Poerdwadarminta Ali (2014) argues that if the outcome attained is commensurate with the expectation, optimization poses an effective and efficient achievement of an outcome which is congruent with as expected. Optimization is also frequently defined as a measure, in which all needs can be fulfilled by activities carried out.

Applying the optimization concept means using production factors in production activities as optimum as possible, and thereby resulting in optimum products. Optimum products will lead to the achievement of maximum income with minimum cost (Masniati, 2012:04).

Suriaatmaja (2015:02) contends that optimization in the use of production factors, in principle, is how to use the factors efficiently. Based on the terminology in the science of economy, efficiency is categorized into three, namely technical efficiency, allocative efficiency (price efficiency), and economic efficiency. Technically efficient use of production factors means the production factors used result in a maximum product. Price efficiency or allocative efficiency will be created if the value of a marginal product is equal to the price of production factors concerned, and economic efficiency denotes an agricultural business which has attained technical and price efficiencies. Finally, the combination of optimal factors is the combination of production factors with the lowest cost, which is foreseeable to afford a small profit. However, the combination of production factors with a high cost does not necessarily confer a maximum profit. Acquiring a maximum profit requires the factors to be arranged commensurate with the combination of optimum production factors. As farmers' production factors, especially capital, commonly come in a limited number, their use of the factors is inefficient.

Integrated Crop-Livestock Farming System

An integrated crop-livestock system (SITT) in a local agricultural business is an accomplished engineering science and engineering of agricultural

resources. SITT, basically, is inseparable from the principles of farming science which further develops. The science of farming is a process of biological production which uses natural, human, capital, and management resources, which are restricted in number. Because of the restricted numbers, the SITT implementation in the process of agricultural production cannot be apart from the economic principles and theories (Kusnadi U., 2008:193).

The underlying character of crop-livestock integration is synergism or correlation which share the common benefits to the crops and livestock. Farmers use cattle wastes as organic fertilizer for their crops and leverage agricultural wastes as fodder. The correlation between and a nutrient cycle of the integrated crop-livestock model is exhibited in Figure 1 (Reijntjes *et al*., 1999 in Ismail and Andi Djayanegara, 2004).

A sustainable integrated agricultural system can be examined from three interrelated aspects, which are ecology, economy, and society. As regards the ecological aspect, an integrated agricultural system can create eco-friendly agriculture, solving soil fertility degradation. Attributed to the economic aspect, this system is profitable, because an integrated agricultural system is a concept of using land resources maximally. Therefore, farmers will earn profits from several farming businesses run on a certain land area. Meanwhile, concerning the social aspect, an integrated agricultural system, with its local wisdom concept, is easily accepted by the community (Apriyani, 2011).

Integrated Food Crop-Cattle Farming System

Cattle cultivation development in an agricultural area can be carried out by raising local resources and rice-corn and cattle by-products optimally. An integrated food crop-cattle farming is a farming system which allows the farming management to be integrated with varying components of rice-corn-cattle farming.

Suwani (2005), in his research, indicates that an integrated cow-rice farming system in Sragen increases farmer income and improves soil fertility by increasing nutrients from compost. It is manifested by the increase in grain yields per season (IDR145,000/ha). Additionally, food productivity increases as well (quantified from the value of concentrate savings of IDR1.50 million/year). Work opportunities increase too, contributed by waste management, and attain 100HOK or IDR1 million/year).

Sahara, L.O. (2019) asserts that an integrated rice, corn, sugarcane, and cow farming system has double effects (multiplier effects) on cattle, farmers, and the environment. Cows consume fodder from agricultural wastes, increasing farmer income and averting environmental damage due to the burning of agricultural waste. Burning agricultural wastes may cause land degradation, a polluted environment, a damaged ecosystem, and lost biodiversity.

RESEARCH METHOD

Research Area and Time

This research is carried out in October-November 2020 in Bulango Selatan, Tapa, and Suwawa Bone Bolango. The locations are the bases for raising cattle and food crops (rice-corn) owned by the local government (the Department of Agriculture and Livestock Bone Bolango, 2019).

Data Type and Source

Data collected in this research are primary and secondary. The primary data, in the form of cross-section data, are gathered by interviewing farmers using a question list which has been prepared. Meanwhile, secondary data are collected from sources and institutions which have relevant data entailed, e.g., books, Statistics Indonesia in Bone Bolango, Statistics Indonesia Suwawa, Statistics Indonesia Tapa, and Statistics Indonesia Bulango Selatan.

Population and Sample

The population is the aggregate research objects, composed of real or abstract objects, phenomena, or symptoms regarded as data sources which contain data and share common and certain characters. The population of this research is all farmers who apply an integrated corn, rice, and cattle farming system in Bone Bolango. There are five farmers, so sampling is executed using saturation. Saturation is a sample determination technique if all population members are used as samples. Saturation should be performed here because of the relatively small population which used as the research sample. The linear chief point of programming is looking to an optimal combination by collecting informative data and not strictly targeting a large sample.

Data Analysis Technique

To analyze data, we used a descriptive-quantitative analysis technique, and the output is in the table, ratio, and percentage forms.

Farmer Income Analysis

Net farm income, by definition, is a difference between gross farm income and total farm expenditure. The difference result can be used to quantify rewards acquired by farmer families from the aspect of the use of the production factors of work, management, and capital (Soekartawi in Wibowo, 2012:39). Thus, the farm income is formulated as follows.

$$\pi = TR - TC$$
$$TR = Y \times Py$$
$$TC = TFC + TVC$$

Where:

- π = farmer income
- TR = farmer acceptance
- TC = total cost (IDR)
- Y = production
- Py = price
- TFC = total fixed cost
- TVC = total variable cost

Farmer income will be higher if the farming undertaken is efficient, or if the use of production factors spends minimum costs for maximum production. Farmer success is measured by not only a large number of production outcomes but also the number of costs spent during the production processes. Accordingly, production processes are considered important for determining farmer net income. As such, based on the above explanation, costs, acceptance,

and income correlate to each other (Soekartawi, 2011).

RESULT AND DISCUSSION

A. Farming Characteristics

Rice farming is one of the Bone Bolango farming businesses. Indonesian people, in general, and Bone Bolango community, in specific, consume rice as a staple food. The average rice field area is 0.58 hectares and the rice variety cultivated is Mekongga. Rice is cultivated twice a year and the average rice produced is 43.4 sacks/farmer. A sack contains nine bushels of grain, which later, after being processed, will result in 63 kg of rice. Corn farming distinguishes Gorontalo Province from other provinces, marking it as one of the corn-producing provinces in Indonesia. The average cornfield area is 0.7 hectares and the corn variety cultivated is Bisi 18. Corn is also cultivated twice a year and the average corn produced is 1,150 kg/farmer. A clearer explication is demonstrated in Table 1.

Table 1. Rice and Corn Farming Characteristics in Bone Bolango, 2021

Type of Farming	Planted Area (Ha)	Variety	Planting Frequency (Time/year)	Production (Kg/season)
Rice	0.58	Mekongga	2	390.6
Corn	0.7	Bisi 18	2	1,150

Source: Primary Data Processed, 2021

As exhibited in Table 1, the area planted with rice and corn is 0.58 Ha and 0.7 Ha, respectively. The rice variety cultivated is Mekongga, and the corn variety is Bisi 18. Planting is conducted twice a year and yields 390.6 kg/season of rice and 1,150 kg/season of corn. This indicates that the production results of rice and corn farming are considered low. Hence, rice and corn farmers should make production elevation.

B. Cattle Farming Characteristics

Cattle farming is an effort to run cattle farming activities which regard cattle as a business object. Lands, which are considered as an ecological and technological base, are used as a tool to achieve the purpose. The average number of cattle is listed in Table 2.

Table 2. Cattle Classification and Cattle Farmer Income Levels in Bone Bolango, 2021

Classification of the Number of Cattle (Cow)	Total Number of Farmers	Cattle Weight (Kg)	Net Cattle Sale (IDR)	Fodder Cost (IDR/year)	Net Income (IDR)
3-4	1	1,100	45,000,000	11,000,000	34,000,000
5-6	2	4,400	180,000,000	44,000,000	136,000,000
7-8	1	2,550	105,000,000	25,500,000	79,500,000
9-10	1	3,600	150,000,000	36,000,000	114,000,000
Total	5	11,650	480,000,000	116,500,000	363,500,000
Average	1	2,330	96,000,000	23,300,000	72,700,000

Source: Primary Data Processed, 2021

As indicated in Table 2, the classification of three-four cows with a weight of 1,100 kg comes with a net cattle sale of IDR45,000,000 and spends IDR11,000,000/year for fodder. The net income is hence IDR34,000,000. Furthermore, the classification of five-six cows with a weight of 4,400 kg comes with a net cattle sale of IDR180,000,000 and spends IDR44,000,000/year for fodder. The net income is therefore IDR136,000,000. The classification of seven-eight cows with a weight of 2,550 kg comes with a net cattle sale of IDR105,000,000 and spends IDR25,500,000/year for fodder. The net income is therefore IDR79,500,000. The last classification, the classification of nine-ten cows with a weight of 3,600 kg comes with a net cattle sale of IDR150,000,000 and spends IDR36,000,000/year for fodder. The net income is thus IDR114,000,000. Based on Table 2 too, the average net income acquired by farmers is IDR72,700,000.

C. Income of Farmers Applying an Integrated Corn, Lowland Rice, and Beef Cattle Farming System

Farming costs are the costs spent by farmers in every planting season. The costs are identified by quantifying the average costs spent during the farming process. These farming costs are factors which affect farming activities for being the capital used by farmers to run their farming processes. Accordingly, income levels matter for supporting farmer welfare. As such, costs spent by farmers during a farming process should be quantified to identify the net income. To identify income levels from rice and corn, we should quantify several components, i.e., rice and corn acceptance and some costs, namely seed costs, fertilizer costs, and labor costs. The points analyzed from rice and corn components are productivity levels, price/unit, cost/season, and the percentage of each component. The income levels are listed in Table 3.

Table 3. Income Levels in Rice and Corn Farming in Bone Bolango, 2021

Component	Productivity Level (kg/Ha)	Price/Unit (IDR/kg)	Cost (IDR/season)	Percentage (%)
Acceptance				
Rice	390.6	10,000	3,906,000	57.60
Corn	1,150	2,500	2,875,000	42.40
Total		**6,781,000**		**100.00**
Cost				
Seed				
Rice	14.5	10,000	145,000	2.76
Corn	10.5	114,600	1,084,500	20.64
Fertilizer				
Rice				
Urea	130	1,800	234,000	4.45
Phonska	165	2,300	379,500	7.22
Corn				
Urea	140	1,800	252,000	4.8

Organic	230	2,300	529,000	10.07
Labor				
Rice		50,000	1,370,000	26.08
Corn		50,000	1,260,000	23.98
Total			**5,254,000**	**100.00**
Net income			**1,527,000**	**100.00**

Source: Primary Data Processed, 2021

Based on Table 8, rice and corn farming acceptance are IDR3,906,000 and IDR2,875,000, respectively, at a percentage of 57.60% and 42.40%, respectively, and accordingly, the total acceptance is IDR6,781,000. The cost spent on rice and corn seeds is IDR145,000 and IDR1,084,000, respectively at a percentage of 2.76% and 20.64%, respectively. The cost spent on rice and corn fertilizer is IDR613,500 and IDR781,000, respectively at a percentage of 11.67% and 14.87%, respectively. The cost spent on rice and corn labor is IDR1,370,000 and IDR1,260,000, respectively at a percentage of 26.08% and 23.98%, respectively. As such, the total net income is IDR1,527,000. It demonstrates a relatively low farmer income level and hence plant intensification should be carried out to accrue production results and boost income levels.

CONCLUSION

Predicated on the research results, the average income of farmers who implement an integrated corn and lowland rice farming system in Bone Bolango is IDR1,527,000. Meanwhile, the average income acquired from cattle farming and sales is IDR72,700,000. In conclusion, an integrated corn, lowland rice, and cattle farming system affords a high profit.

REFERENCES

Ali, M. A., 2014, Analisis Optimalisasi Pelayanan Konsumen Berdasarkan Teori Antrian pada kaltimgps.com di Samarinda, Ejournal Ilmu Administrasi Bisnis.

Apriyani *et al*., 2011, Dampak Program Sistem Integrasi Tanaman-Ternak terhadap Pendapatan dan Pengeluaran Petani: Analisis Simulasi Ekonomi Rumah Tangga, Forum Pascasarjana Vol. 31 No. 1 January 2008:45-58.

Ismail I. G. and A. Djajanegara, 2004, Kerangka Dasar Pengembangan SUT Tanaman Ternak (Draft), Jakarta, Proyek PAATP.

Kusnadi U., 2008, Inovasi teknologi peternakan dalam sistem integrasi tanaman-ternak untuk menunjang swasembada daging sapi potong. Jurnal Pusat Penelitian dan Pengembangan Peternakan Jalan Raya Pajajaran Kav. E-59, Bogor

Masniati *et al*.,. 2012, Optimalisasi Kombinasi Cabang Usaha Tani Tanaman Pangan untuk Memperoleh Pendapatan Maksimum di Wilayah Transmigrasi km 38 Kelurahan Sei Gohong Kecamatan Bukit Batu Provinsi Kalimantan Tengah, Jurnal Volume 02, Kalimantan Tengah.

Sahara, L. O., Fanani, Z., Nugroho, B. A., and Djunaidi, I. H., 2019. "*Analysis of Region Potency and*

Typology of Beef Cattle Livestock at Gorontalo Regency," In *IJAR: International Journal of Advanced Research,* Vol.7 No.9, pp. 88-95.

Suriaatmaja M Erwan, 2015, Optimalisasi input usaha tani padi sawah (studi kasus Desa Clumprit Kecamatan Pagelaran Kabupaten Malang). Jurnal AGRIFOR Volume XIV Number 2, Samarinda Kalimantan Timur.

Suwandi, 2005, Keberlanjutan Usaha Tani Terpadu Produksi Padi Sawah-Sapi Potong Terpadu di Kabupaten Sragen: Pendekatan RAP-CLS. Dissertation. Postgraduate Program in Institut Pertanian Bogor, Bogor.

Winardi, 2014, Inovasi Teknologi Budidaya Padi Sawah yang Telah dan Sedang Dikembangkan di Sumatra Barat dalam Rangka Peningkatan Produktifitas Padi Sawah, Jurnal, Faculty of Agriculture Universitas Andalas, Sumatra Barat.