



## Research Article

# Economic Feasibility of Integrated Agriculture Pattern for Bali Cattle (*Bos javanicus*) in North Central Timor Regency

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### ABSTRACT

This study aims to: (1). know the economic feasibility of integrated livestock farming in North Central Timor Regency. (2). Describe the feasibility of integrated livestock farming from an economic aspect in North Central Timor Regency. The analysis used in this research are descriptive and economic feasibility analysis (R/C ratio). The data obtained are in the form of primary data and secondary data. The results of the descriptive analysis show that the potential that is owned, such as the availability of paddy field with an average of 37.85 acres / person and upland land with an average of 45.54 acres / person are able to produce an average of 407.26 kg / year / person of rice, 501.33 kg / year / person of corn. So that it can produce agricultural crop waste such as rice straw amounting to 6.109 tons / ha / year and corn waste of 7.520 tons / ha / year. It can be said that rice and corn agricultural waste is able to help the availability of feed for cattle as much as 4 cows / year. The feasibility of the integration pattern of farming and livestock in TTU regency is feasible. The results of the R / C Ratio analysis, is 8.44 (R / C Ratio > 1) with a revenue of Rp.607,405,000 of the total cost incurred of Rp.192,000,000.

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## INTRODUCTION

The cattle population in Indonesia has increased since the last two years with details in 2018 the number of cattle populations was 16,432,945 cows and in 2019 that number was increasing with a total cattle population of 17,118,650 cows (BPS, 2020). East Nusa Tenggara Province is one of the provinces that participates in the production of fulfilling the national cattle needs. In 2018, the province of East Nusa Tenggara had a total cattle population of 1,027,286 cows, and in 2019 the cattle population increased to 1,087,615 cows (East Nusa Tenggara Province Livestock Service, 2020).

North Central Timor regency is one of the regencies in East Nusa Tenggara Province that also produces cattle, with a total cattle population of 125,165 cows in 2018, then in 2019 it increased to 132,675 cows (The Livestock Service Office of North Central Timor Regency, 2020). This increase in population is due to the existence of smallholder livestock businesses which are influenced by the increasing demand for the cattle

market. This increase in demand aims to meet the food needs of the community and also exports to other countries.

In February 2020, the total population of people working in the food crop sub-sector was 17.22 million people (49.20%) of the total population working in the agricultural sector. This sub-sector is the sub-sector that absorbs the most labor compared to other sub-sectors in the agricultural sector. When compared to the same period in 2019, the population working in this sub-sector reached 17.57 million people, so it can be said that the number of people working in the sub-sector decreased by 0.27%. The population working in the plantation sub-sector in 2020 reached 10.31 million people (29.46%) of the total workforce in the agricultural sector. When compared to the same period in 2019 which was 10.22 million people, it can be said that there was an increase of 0.6%.

The population working in the livestock sub-sector reached 4.30 million people (12.28%) of the total workforce in the agricultural sector, when compared to the same period in 2019 where the number of workers in the livestock sub-sector reached 4.33 million people, so it can be seen that there has been a decrease in the number of people working in the livestock sub-sector by 0.06%. Meanwhile, the number of people working in the horticulture sub-sector in February 2020 reached 3.17 million people (9.05%), when compared to the same period in 2019 where there were 3.30 million people, there has been a decrease in the number of people working in the horticulture sub-sector by 0.27%.

The community's dependence on the agricultural sector is very large to provide employment and meet the availability of animal feed. Livestock commodities have a significant role in providing nutritious food, increasing income, providing employment and alleviating poverty (Sulistiyowati, 2006). Some people, especially in the village, have a low bargaining position on farming, both in agriculture and animal husbandry. The problem that is often seen is in the control of business capital in the management of livestock business. Cattle, especially beef cattle, are one of the sources of food ingredients in the form of meat that have high economic value, and have an important meaning in people's lives. The cattle business has the potential to be developed as a profitable business. Cattle is one of the largest meat-producing livestock commodities that produce national meat production (Suryana, 2009). The Ministry of Agriculture stated that national beef production would increase in 2020 although it was still unable to meet domestic supply needs. Based on the initial prognosis set by a number of ministries in a limited meeting, the national meat production was set at 2.32 million cows or equivalent to 422,533 tons of meat. This production volume increased by 17,943 tons or grew by 4.43% compared to the production in 2019 which was projected to amount to 404,590 tons (Ministry of Agriculture, 2020)

The government through its various programs has significantly helped farmers in the development of cattle, both through the introduction of new technology, especially animal feed and other technical aspects such as cage construction and cage sanitation. Cattle is one of the components in the dry land farming system that is most closely related to other production components. The inclusion of livestock in the farming pattern can encourage the planting of grass and annual crops as a source of animal feed which also functions as a terrace reinforcement. Increasing livestock productivity can be done through three approaches, namely the selection of potential livestock types in an agro-ecosystem area and improvement of the maintenance system to increase the supply of quality animal feed on an ongoing basis. Thus, livestock rearing is expected to develop and support the ecosystem balance of an area. (Ibrahim Marwan, et al: 1988). Agriculture integrated with livestock has become one of the profitable agricultural models and is recommended for marginalized agriculture throughout Asia (Behera & France, 2016).

East Nusa Tenggara Province has the potential to develop dry land agriculture, therefore one of the strategic steps taken by the East Nusa Tenggara government is to create a program in dry land agriculture known as the *Tanam Jagung Panen Sapi* (TJPS) program (growing corns and harvesting cows). The TJPS program is a program created by the government of East Nusa Tenggara which aims to make farmers continue to produce quality corn so that later they can generate more capital to buy livestock such as cows, goats, pigs, and to keep food availability safe. Beside that, the seeds provided from the TJPS program are not only drought tolerant but also in accordance with the socio-cultural conditions of farmers in the East Nusa Tenggara region where at harvest time, the stems and leaves can be used as forage for livestock.

North Central Timor regency (TTU regency) is one of the regencies in the province of East Nusa Tenggara (NTT), located on the island of West Timor, which has great potential for the development of Bali cattle. This is because Bali cattle have been introduced in small numbers to the island of Timor since 1912 and these cattle breed rapidly and the population continues to increase (Toelihere, 1993). Agriculture that is integrated with livestock is an agricultural system that has been practiced for generations by local farmers (Soedjana, 2007).

According to BPS TTU data for 2020, the largest livestock population in North Central Timor regency is beef cattle with a total of 129,325 cows in 2019, so beef cattle have great potential and are very feasible to be developed in North Central Timor regency. A business feasibility study is an activity that studies in depth about the business activity or business that will be carried out, in order to determine whether or not the business is feasible or not. The object studied is not only in large businesses, but also in medium or small businesses (Kasmir and Jakfar, 2003). Therefore, the integration of agriculture and cattle in TTU Regency is carried out in several patterns, namely the integration between cattle and lowland rice businesses, or integration between cattle and corn.

## METHOD

Indonesia currently still lacks beef supply. The shortage is due to the increasing consumption of meat by the people and the production of beef cattle in the country has not been able to keep up with the increase in public consumption. Increasing the national meat supply needs to be done in order to be able to meet the public's need for beef, one of which is the program to increase domestic meat production. The program to increase domestic beef production is expected to increase the national beef supply and reduce dependence on imported beef and feeder cattle.

Smallholder farms have the largest proportion of livestock ownership in Indonesia. Increased production at the level of smallholder farms must be carried out in order to increase national beef production. Increased production can be done by modernizing smallholder beef cattle farms. Integrated agricultural business with cattle farming in North Central Timor regency consists of several patterns such as integration of lowland rice farming with cattle farming, integration of corn farming with cattle farming, and integration of other crops with cattle farming. Before the development is carried out, it is better to do a financial assessment first.

Financial analysis is a feasibility analysis that looks at the farmer's point of view as the owner. Analysis from a financial perspective is used to make projections on the budget that will estimate gross revenues and expenditures in the future. This includes costs related to the production process and credit payments issued by farmer households in order to determine the amount of income received as remuneration, management skills and capital issued by farmers (Gittinger 2008). Financial analysis can be used to determine the feasibility of a livestock business that is carried out using investment criteria. The calculation in the investment criteria used is the R/C Ratio. This feasibility analysis was carried out as an evaluation material for beef cattle farmers in North Central Timor regency, East Nusa Tenggara Province.

This research was conducted in North Central Timor Regency from August to October 2020. The data collection method used in this study was a method consisting of Primary Data and Secondary Data. The population is the total number of units or individuals whose characteristics are to be studied. These units are called units of analysis, and can be people, institutions, or objects, etc. (Djawranto, 1994). The population in this study are farmers who carry out integrated agriculture with livestock in North Central Timor regency. The sample is part of the population whose characteristics will be studied (Djawranto, 1994). Sampling was carried out in stages, namely: (1) Location sampling was carried out by purposive sampling, which represented the integration pattern of lowland rice plants with cattle (Biboki Anleu District), representing the integration pattern of corn plants with cattle (Insana District); and (2) Sampling of respondents was carried out by quota sampling, in which 30 respondents were taken from each sub-district so that a total of 60 respondents were obtained.

Descriptive analysis is carried out to describe a collection of data or observations that have been carried out which include land potential, livestock potential, facilities and infrastructure potential, farmer experience, and market share. Analysis of feed availability is carried out to find out the capacity of beef cattle in an area, showing the maximum population of beef cattle that can exist in the area based on the availability of forage feed. To determine the capacity of beef cattle development, the data obtained were further analyzed using descriptive analysis with the identification and analysis of the data used as follows:

- a) Calculating the carrying capacity value by using the following formula:

$$\text{Carrying capacity (STn)} = \frac{\text{Dry matter production (Ton/th)}}{\text{Adult cow dry matter requirement (Ton/ST/th)}}$$

- b) Calculating Livestock Concentration Index (IKT) by describing the livestock population density comparatively between sub-districts.

- c) Calculating the value of the Capacity for Increasing the Population of Ruminant Livestock (KPPTR) by calculating the difference between the carrying capacity of food plant waste feed and the number of existing ruminants.

Economic analysis is intended to determine the composition of total production costs, revenues, profits, business efficiency, and R/Cratio of beef cattle farming.

- a) Total costs are all expenses for the production process, both fixed costs and variable costs. The mathematical equation is as follows:  $TC=TFC+TVC$

Description:

TC = Total Cost (Rp/year)

TFC = Total Fixed Cost (Rp/year)

TVC = Total Variable Cost (Rp/year)

- b) Revenue is the result received by the farmer from the sale of the output. The mathematical equation is as follows:  $TR=Pq \times Q$

Description:

TR = Total Revenue (Rp/year)

Pq = Price of Quality/ price per product (Rp/year)

Q = Quantity/ production (per cow)

- c) Profit is the difference between the total revenue and the total costs incurred by the farmer. The mathematical equation is as follows:  $P=TR-TC$

Description:

P = Profit (Rp/year)

TR = Total Revenue (Rp/year)

TC = Total Cost (Rp/year)

- d) Business efficiency

$E_p = \frac{R}{C}$  Ratio

Description:

$E_p$  = Business Efficiency

R = Total Revenue (Rp/year)

C = Total Cost (Rp/year)

Criteria of R/C Ratio:

R/C < 1 = not worth developing

R/C = 1 = break-even point

R/C > 1 = worth developing

## RESULTS AND DISCUSSION

### Geographical Conditions

According to the BPS of TTU regency (2019), TTU regency is astronomically located between: North: 9° 2' 48" South Latitude: 9° 37' 36" South East Longitude: 124° 4' 2" East West Longitude: 124° 46' 0" East Longitude. The total area (land) of TTU regency is 2,669.70 km<sup>2</sup> or 5.64 percent of the total land area of the East Nusa Tenggara province, while its water area (sea) is 950 km<sup>2</sup>. The administrative borders of North Central Timor regency are as follows:

- To the south, it is bordered by South Central Timor regency.
- To the north, it is bordered by the Ambenu region (Timor Leste) and the Savu Sea.
- To the east, it is bordered by Belu regency.
- To the west, it is bordered by Kupang and South Central Timor regencies.

In general, the area of Biboki Anleu District is 206.40 Km<sup>2</sup> or 7.73% of the area of North Central Timor regency and some parts of the area are bordered by the coast, with an altitude range of 100 meters above sea level. This district has 9 villages, namely Oemanu Village, Nifutasi Village, Ponu Village, Kotafoun Village, Tuamese Village, Maukabatan Village, Sifaniha Village, Nonotbatan Village, and Motadik Village. Biboki Anleu district is bordered by; 1) North: North Coast. 2) south: Biboki Selatan district. 3) east: Belu regency. 4) West: Biboki Feotleu district (BPS, 2018).

Insana district has an area of 333.08 km<sup>2</sup> consisting of 17 villages namely Botof, Keun, Fatuana, Loeram, Nesam, East Nesam, Manunain A, Manunain B, Oenbit, Sekon, Susulaku A, Susulaku B, Tapenpah, Ainiut, Fatoin, Nunmafo and Bitauini. Insana district is bordered by; 1) North: Biboki Selatan and Biboki Tanpah districts. 2) south: Insana Barat and Malaka regency. 3) East: Malaka regency. 4) west: Insana Tengah and Insana Barat districts (BPS, 2018).

### Population Situation

BPS data of TTU regency (2019) shows the number of registered residents is 225,094 people with a density level of 4 people/household and a population density of 84 people per km<sup>2</sup>. The largest population in TTU regency is in Kota Kefamenanu district, with 15.9 percent. While the smallest population is in East Noemuti district, which is 1.7 percent. Kota Kefamenanu is a sub-district with the highest level of household density and population density, which are 5 people/household and 483 people/km<sup>2</sup> respectively.

Biboki Anleu district has a population of 16,282 people, demographically dominated by 8,258 men or 50.7% while only 8,024 women with a percentage of 49.3%. The livelihoods of the community in Biboki Anleu consist of several types of work, including Farmers/breeders, Fishermen, Retirees, Civil Servants, Private Employees, TNI, POLRI and Entrepreneurs. The proportion is partly dominated by Farmers/breeders as many as 14,344 people or 91.5%, Fishermen as many as 31 people or 2.1%, pensioners as many as 33 people or 0.7%, civil servants as many as 181 people or 3.8%, private employees as many as 29 people or 0.6%, TNI and POLRI as many as 51 people or 1.1%, and entrepreneurs as many as 49 people or 1.0% (BPS, 2018).

The population of Insana district is 20,392 people, consisting of 10,087 men and 10,305 women. This sub-district has 172 RTs, 74 RWs and 57 *dusun* (hamlets). The population of Kecamatan Insana on average has a livelihood as farmers and breeders that are 3,930 people, civil servants are 97 people, teachers are 284, TNI/Polri are 19 and other jobs are 545 (BPS, 2018).

### Respondent Identity

Respondents are all people both individually and collectively who are asked for information needed by data seekers. Respondents in this study were farmers who own paddy fields and corn and have cattle. There are 60 respondents with the distribution of the number of respondents per sub-district is 30 people. Through the distributed questionnaires, the identity of the respondents was found as attached in table 1.

**Table 1.** Number of Respondents According to Age

Age	Frequency	Percentage (%)
35-39	4	6,7
40-44	10	16,7
45-49	11	18,3
50-54	11	18,3
55-59	9	15
60-64	6	10,0
>65	9	15
<b>Total</b>	<b>60</b>	<b>100</b>

Source: Processed Result of Primary Data (2020)

From table 1, it can be seen that there are 4 respondents aged 35-39 years old or 6.7%, farmers in the age range of 40-44 years are as many as 10 people or 16.7%, farmers in the age range 45 -49 years are 11 people or 18.3%, there are also farmers in the 50-54 year age range as many as 11 people or 18.3%, and in the 55-59 year age range there are 9 people or 15% , there are as many as 6 people or by 10% in the age range of 60-64 years, and there are as many as 9 people or by 15. in the age range ≥65 years So that the total respondents are as many as 60 people. The number of respondents according to the level of education can be seen in table 2 below.



**Table 2.** Number of Respondents According to the Level of Education

Education	Frequency	Percentage (%)
S1	4	6,7
SD	21	35
SMP	10	16,7
SMA	14	23,3
No School	11	18,3
<b>Total</b>	<b>60</b>	<b>100</b>

Source: Processed Result of Primary Data (2020)

In table 2, it can be seen that the education level of the respondents are SD/elementary school graduates (as many as 21 people or 35%), SMP/junior high school graduates with as many as 10 people or 16.7%, high school graduates with 14 people or 23.3 %, and there are 11 people who did not go to school or 18.3%. While respondents who have a bachelor's degree are 4 people or 6.7%. This shows that farmers in TTU regency have a relatively low level of education which of course greatly influences the use of technology and the novelty of science/knowledge in farming and animal husbandry.

### Potential Area of Rice Fields, Fields and Cattle Ownership

The area of land greatly affects the main production of both rice and corn as well as the waste produced which will be used for cattle feed. The area of paddy fields and upland lands owned by respondent farmers ranged from 0.17 to 1 hectare. Data on land area at the research site are presented in Table 3.

**Table 3.** Area of paddy fields and upland lands

Type of land	Land area	Average land area	Total	Total production	Average production
Paddy fields	17-100 acres	37,85 acres	30 persons	12.218 kg	407.26 kg/are
Upland lands	10-200 acres	45,54 acres	30 persons	15.040 kg	501.33 kg/are

Source: Processed Result of Primary Data (2020)

In Table 3, it is shown that 30 respondents have an area of paddy fields ranging from 17-100 acres with an average rice field ownership of 37.85 acres. The area of upland lands of 30 respondents ranged from 10-200 acres with an average land ownership of 45.54 acres. This area of land greatly determines the production of rice, corn and other crops that can be used for animal feed. Based on the results of the research, it is known that for the area of the farmers' paddy fields, the average productivity produced is 407.26 kg/acres. Meanwhile, for the upland land with an area of 45.54 acres, the average productivity is 501,040 kg/acres. The more production generated, the greater the availability of straw as animal feed used in this system farming business. The results of this study indicate that the production of agricultural crops, namely rice and corn, is lower than the results of research by Basuni et al., (2010), who reported that the integrated system of rice and beef cattle gave a rice production of 5.34 tons/ha. Meanwhile, the number of beef cattle describes the number of livestock owned by the respondents, especially those integrated with agricultural crops such as rice and corn. The number of beef cattle owned by each respondent varies, ranging from 1 to 10 cows. The number of beef cattle ownership in integrated system farmers in North Central Timor Regency is presented in Table 4.

**Table 4.** Cattle Ownership Data

No	Cattle age	Number of cattle per person	Number of cattle	Percentage (%)
1	Calves	1-5 cows	45	34,35
2	Young cows	1-6 cows	30	22,90
3	Adult cows	1-10 cows	56	42,75
<b>Total</b>			<b>131</b>	<b>100</b>

Source: Processed Result of Primary Data (2020)

Table 4 shows that the biggest number of cattle owned by the respondents is on a scale of 1-10 cows, which is 56 adult cows (64.03%) and the lowest number is young cattle with a scale of 1-6 cows per person (22.90%). This shows that the scale of beef cattle ownership owned by the respondents is still relatively small, this is because the respondents only make beef cattle business as a side business. The number of livestock owned greatly determines the amount of output in the form of cow dung which can be used for organic fertilizer in supporting the availability of fertilizer for paddy rice and corn that is cultivated. The more livestock they have, the greater the organic fertilizer that can be used for paddy rice.

### Potential Waste of Rice, Corn, and Cattle

The potential waste of paddy field, corn and other plants described in this study is rice straw and corn stalks which can be used as additional animal feed, while the waste from beef cattle is cattle faeces (dung) which can be used for organic fertilizer to support the availability of needs of fertilizer for paddy rice, corn and other crops. A description of the potential of straw and corn in North Central Timor regency is presented in Table 5.

**Table 5.** Potential of Rice straws and Corn Stalks and Cattle Feed Needs

No	Types of plant waste	Total	Description
1	Rice straws	6,109	Ton/ha/year
2	Corn stalks	7,520	Ton/ha/year
3	Feed requirement for one adult cow	2,25	Ton/ha/year

Source: Processed Result of Primary Data (2020)

The availability of rice waste in each production is around 6-7 tons of straw (dry weight/ha). Meanwhile, corn waste in each production is between 7-8 tons/ha. The amount of this production varies greatly because it is influenced by location, type of variety, method, and time of cutting. The rice straw produced can be used to meet the feed needs of 3-5 adult cows per year. So, if farmers are able to harvest rice twice a year, it will help in the availability of feed for beef cattle as much as 4-6 cows. Based on the results of research conducted, it is revealed that the average production of rice straw is 6,109 tons/ha/year while for corn stalk waste is 7,520 tons/ha/year. According to the National Research Council (2012), the need for dry matter (BK/Bahan Kering) 1 unit of livestock is 2.25 tons/ha. Thus, if the respondent has an average of 4.08 adult cows, then the dry matter requirement for straw is 9.13 tons/hayear.

Therefore, the production potential of rice straw and corn plant waste for animal feed is very sufficient with the difference in the availability of animal feed, which is 4.63 tons/ha/year. Meanwhile, related to the waste from beef cattle for the needs of paddy field which is from cow faeces (dung), respondents can use it as organic fertilizer for paddy fields. So that economically the application of the livestock rice integration system is able to minimize production costs in processing the respondent's rice and livestock more efficiently from the input side (Bailey et al., 2003; Biala et al., 2008). Every one beef cattle is able to provide 1.5 – 2 tons of organic fertilizer, because one beef cattle produces 8-10 kg of dung per day (Budyanto, 2011).

**Table 6.** Average Potential of Beef Cattle as Organic Fertilizer Producer

No	Description	Average amount (per year)	Note
1	Number of cattle	6	Cows
2	Organic fertilizer being produced	10	Ton/year
3	Total fertilizer use for planting season 1+ planting season 2	2,1	Ton/year

Source: Processed Result of Primary Data (2020)

Based on the results of the research in Table 6, it is shown that the average respondent's livestock ownership is 6 cows. So, the production of organic fertilizer that can be obtained is as much as 10 tons/year by taking the annual organic fertilizer production which is 1.5 tons. Meanwhile, the need for organic fertilizer used in paddy field is only 2.1 tons/year. Therefore, it can be concluded that based on the analysis, the output potential owned by the respondents in the livestock paddy field integration system at the research location is very suitable to be applied sustainably in order to improve the welfare of farmers. This is in line with the results of the study (Bieluczyk et al., (2020) which shows that the crop cultivation system with grazing and the cultivation of corn plants intercropped with grass could increase the C and N stocks of the soil so that the use of fertilizer inputs would be more efficient.

**Table 7.** Excess of animal feed

No	Description	Average number (per year)	Note
1	Number of cattle	440	Ekor
2	Corn stalks	7.520	Ton/Ha/year
3	Rice straws	6.109	Ton/Ha/year
4	Feed requirement for one adult cow	2,25	Ton/Ha/year
Total feed		990	Ton/Ha/year
Difference		12.639	Ton/Ha/tahun

Source: Processed Result of Primary Data (2020)

Based on Table 7, it can be seen that the highest animal feed was obtained from corn commodity which was 7,520 Tons/Ha/year. For the rest, the farmers used rice straw as animal feed, amounting to 6,109Tons/Ha/year. The high number of farmers who used corn stalks compared to straw was because this commodity is larger in number than other commodities. With a total of 440 cattle, the feed requirement for one adult cow is 2.25 Tons/Ha/year, with a difference in feeding of 12,639 Tons/Ha/year (other feeds such as: Lamtoro, kinggres, gala-gala leaves, banana stems, and weeds).

### Economic Feasibility Analysis

The analysis of balance between total revenue and total cost is a feasibility test for a type of business. The criteria from the analysis of the R/C ratio is that if the value of the R/C Ratio > 1, then the business is said to be profitable and feasible to run, because the amount of revenue is able to cover the costs incurred in farming, and vice versa. Respondents' revenue of this farming system business comes from two sources, namely income from the paddy field farming sector and beef cattle business

**Table 7.** Income of Respondents running the Integration Pattern of Rice Fields and Cattle in Biboki Anleu District

No	Description	Nominal	Average
Cattle business			
1	Cage	Rp 15,000,000	Rp 500,000
2	Feed	Rp 35,000,000	Rp 1,166,667
3	Medication	Rp 16,500,000	Rp 550,000
4	Labor	Rp 26,500,000	Rp 883,333
<b>Total</b>		<b>Rp 93,000,000</b>	<b>Rp 3,100,000</b>
Income (Rp/cow)			
1	Livestock value	Rp 194,250,000	Rp 6,475,000
2	Rice	Rp 112,200,000	Rp 7,012,500
3	Rice straws	Rp 500,000	Rp 250,000
4	Manure	Rp 400,000	Rp 200,000
<b>Total</b>		<b>Rp 307,350,000</b>	<b>Rp 13,937,500</b>
Profit		Rp 214,350,000	Rp 10,837,500
1	R/C ratio		4,50

Source: Processed Result of Primary Data (2020)

Table 7 shows that the integration of rice crops and cattle in Biboki Anleu district requires a total cost of Rp. 93,000,000 with an average of Rp. 3,100,000 per individual. Meanwhile, income from livestock business is Rp. 194,250,000 with an average of Rp 6,475,000. From this total income, the livestock integration pattern in Biboki Anleu district earns a profit of Rp. 214,350,000 with an average of Rp. 10,837,500, which is in line with the research done by Tumewu et al., (2014) related to integrated farming of beef cattle in Bolaang Mongondow Utara.

The R/C Ratio value of integrated lowland rice farming with cattle is 4.50 (R/C Ratio >1). Economically, the rice field and cattle business are feasible to be cultivated or developed. The 4.50 R/C Ratio value means that the sacrifice (production cost) of Rp. 1.00 will get an income of Rp. 4.50. Therefore, based on the results of the R/C Ratio analysis, it can be said that the pattern of integrated rice farming in the Biboki Anleu district is economically feasible to develop. According to Fyka et al., (2019), the availability of rice waste in the form of dry straw in each production is around 4-5 tons of straw (dry weight per ha). The amount of this production



varies greatly because it is influenced by location, type of variety, method and time of cutting. The rice straw produced can be used to meet the feed needs of 2-4 adult cows per year. So, if farmers are able to harvest rice twice a year, it will help in the availability of feed for beef cattle as much as 4-6 cows. The pattern of integration of corn farming and cattle can be seen in Table 8 below.

**Table 8.** Income of Respondents running the Corn Farming and Cattle Integration Pattern in Insana District

No	Description	Nominal	Average
Cattle business			
1	Cage	Rp 18,000,000	Rp 600,000
2	Feed	Rp 30,000,000	Rp 1,000,000
3	Medication	Rp 26,000,000	Rp 866,667
4	Labor	Rp 25,000,000	Rp 833,333
<b>Total</b>		<b>Rp 99,000,000</b>	<b>Rp 3,300,000</b>
Income (Rp/cow)			
1	Livestock value	Rp 220,200,000	Rp 7,593,103
2	Corn	Rp 79,450,000	Rp 4,965,625
3	Corn stalks	Rp 500,000	Rp 250,000
4	Manure	Rp 400,000	Rp 200,000
<b>Total</b>		<b>Rp 300,550,000</b>	<b>Rp 13,008,728</b>
Profit		Rp 201,550,000	Rp 9,708,728
1	R/C ratio		3,94

Source: Processed Result of Primary Data (2020)

Table 8 shows that the integration pattern of corn farming and cattle in Insana district requires a total cost of Rp. 99,000,000 with an average of Rp. 3,300,000. Of the total costs incurred, farmers in Insana district get an income of Rp. 300,550,000 with an average of Rp. 13,008,728. The total income and total costs incurred by farmers get a profit of Rp. 201,550,000 with an average of Rp. 9,708,728. This shows that corn has an effect on livestock production, which is supported by the results of research by Sunada et al., (2014) related to the interaction pattern of Bali cattle in Bangli regency, Bali Province.

The R/C ratio value of integrated corn farming in cattle farming is 3.94 (R/C ratio >1). Economically, the corn and cattle business is feasible to be cultivated or developed. The R/C Ratio value of 3.94 means that the sacrifice (production cost) of Rp. 1.00 will get an income of Rp. 3.94. Therefore, based on the results of the R/C Ratio analysis, it can be said that the integrated corn farming pattern in Insana district is economically feasible to develop. Utilization of corn crop waste has a positive impact on cattle production. According to Budianto (2011), and supported by Ali & Ahmad (2018), the pattern of integration between plants and livestock both provides maximum results from the production aspect so that the integration pattern between plants and livestock is very efficient to develop. The results show that from the two districts observed, the best pattern of integration of agricultural crops and livestock was in the pattern of integration of rice farming and cattle. This can be seen from the value of the R/C ratio in the observation treatment of the integration pattern of paddy rice and cattle which is higher than the value of integration pattern of corn and peanut plants with cattle.

## CONCLUSION

Based on the results of the research and discussion, it can be concluded that the integration of livestock with agriculture in TTU regency, that integrates rice farming and corn crops, has enough potential. This can be seen from the availability of paddy fields, the number of livestock, paddy rice waste, and cattle waste. The potential, such as the availability of paddy field land with an average of 37.85 acres/person and upland land with an average of 45.54 acres/person, is able to produce an average of 407.26 kg/year/person and 501.33kg of corn per year, so that it can produce agricultural crop waste such as rice straw of 6,109 tons/ha/year and corn waste of 7,520 tons/ha/year. It can be said that rice and corn agricultural waste is able to help the availability of cattle feed for as many as 4-6 cows/year.

The feasibility of farming-livestock integration pattern in TTU regency is very efficient to run. This can be seen from the results of the analysis, with a total R/C Ratio of 8.44 (R/C Ratio >1), with an income of Rp.607.405,000 from the Total Cost of Rp.192,000,000 being spent.

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