Contribution of local beef cattle production on farmer’s income in the dryland farming of Kupang Regency, Indonesia

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Abstract. Study on contribution of local beef cattle enterprise on income of dryland farmers in Kupang Regency was conducted from September to December 2016. The study aimed to: (1) determine composition of farm household income in the dry land area of Kupang Regency, Indonesia, (2) analyze contribution of income from local beef cattle enterprise to farm household income. A survey was done on 56 beef cattle farmers who were purposively selected as respondents. All respondents were interviewed using structured questioners with focus on farm household activities and their income. The results showed that total net income of farm household was Rp 14,854,550 per year, out of this Rp 3,246,550 to Rp 5,404,750 equals to 21.85 to 36.38% was from local beef cattle enterprise. To enhance the role of beef cattle enterprise, the owner should improve cattle husbandry management through providing good quality and quantity of feed continuously, as well as empowering livestock extension workers to deliver proper information and technology on beef cattle husbandry to the farmer.

1. Introduction
The predominant role of traditional livestock production in the developing world like Asian and African countries is obvious. In Indonesia, livestock business is an un-separated component of the farming systems. Some African countries such as Zimbabwe considers cow as a sustainable means to improve rural community source of revenue [1]. Livestock production in East Nusa Tenggara (ENT) Province of Indonesia is an integral part of farming systems. Various types of livestock kept by farmers, namely small livestock (goats, sheep, and pigs), large livestock (cattle, buffaloes, and horses), and poultry (chicken and ducks). Among them, beef cattle are the most important livestock for farm households. Beef cattle provide economic, social and cultural roles to the farm households and they become a leading commodity for the province economy development [2]. They further explained that ENT province is one of the centers for Bali cattle development in Indonesia. This province is also the main supplier of beef cattle for other area of Indonesia including West Java and Jakarta, and supplier of breeding cattle to other provinces including transmigration areas in Indonesia. The dominant type of beef cattle in ENT is Bali cattle and cross bred Ongole known as Sumba Ongole (SO). Bali cattle is mainly concentrated in Timor and Flores, while SO are developed well in Sumba island [2][3] explained factors that encouraged the development of beef cattle business in ENT were due to (1)
high demand for beef both locally and nationally, (2) the availability of pasture and leucaena forage that encourages the development of fattening systems of beef cattle mainly in the area Amarasi Sub-district, Regency of Kupang, and (3) increase demand for beef and buffalo from the island of Java, especially Jakarta. Like in other countries, beef cattle in Indonesia has very important roles in fulfilling the demand for meat, a source of breeding cattle and providing agricultural labor, source of income of farm households. In addition, the cattle trade between the islands is one of the backbone of rural economy [4].

In the traditional system as practiced by farm household in Kupang Regency, farmers generally pay less attention on their cattle husbandry. However, in the last decade beef cattle development in Kupang Regency received serious attention from the government because Kupang Regency is a production center for beef cattle and suppliers for national needs, especially for Jakarta Province. The latest data showed the population of beef cattle (cattle Bali) in Kupang Regency in 2014 was 149,243 head while in 2015 the number increased to 154,811 heads or there was an increase by 5.48 %. East Amarasi Sub-district is one of the sub-districts in Kupang Regency that has the largest number of beef cattle. It was reported that cattle population in this area increased by 25 % during the period of 2014-2015, i.e. from 5,202 heads in 2014 to 6,503 heads in 2015 [5]. However, the increase of beef cattle population in the sub-district of East Amarasi did not necessarily increase the welfare of farmers. Beef cattle business in this area is operated in an extensive traditional way. It is difficult to determine how much revenue and cost used to run the business, and how significant is the contribution of the enterprise to the farm household income. Thus, it is necessary to do analysis of farm household income in this area to describe the potential of beef cattle rearing by farmers in contributing the household farm income.

2. Materials and Methods
This research was carried out in August - September 2016 in Pakubaun Village, East Amarasi Sub-district, Kupang Regency, Indonesia. The location was determined purposively because this village has large number of beef cattle in East Amarasi. This research was done by using a survey to collect both primary and secondary data. The primary data collection was conducted by interviewing 56 respondent farm household. The main data collected were (1) respondent characteristics (age, level of education, and farming experience), (2) land tenure and cultivated land area; (3) number of cattle owned, (4) Total costs incurred; (5) revenues obtained from all farm and nonfarm; (6) number of cattle sold; (7) total household incomes including income derived from cattle. The secondary data was obtained from relevant institutes and agencies such as Statistical Central Board (SCB), Department of Animal Husbandry and data from previous studies, these include: information on natural condition of study area, and human resources, beef cattle population. Data analysis was done by descriptive analysis, income analysis of beef cattle and farm household income analysis and total farm household and beef cattle enterprise revenues farm household revenues consisted of revenues derived from farm production and nonfarm revenue including revenue obtained from beef cattle selling. Therefore, total revenues of farm household are the sum of values of all farm products and values of nonfarm product before deducting by all production costs incurred. The costs can be cash costs and in-kind (non-cash) costs. Theoretically, production costs consisted of fixed costs and variable costs.

3. Results and Discussion
3.1. Description of Research Location
This research was conducted in the Pakubaun Village in East Amarasi Sub-district of Kupang Regency, Indonesia. East Amarasi Sub-district has an area of 162.9 km². East Amarasi Sub-district has boundaries as follows: North- Sub-district of Amabi Oefeto and Amabi Oefeto East; South by the Timor Sea and South Amarasi Sub-district, East by Timor Tengah Selatan Regency and West by the Amarasi Sub-district [5].

3.2. Climatic circumstances
In general, the climate in the study area is a tropical climate with two seasons namely dry and rainy seasons. The dry season is relatively longer (approximately 7-8 months) due to the influence of wind flows from Australia which does not contain water vapour. Conversely, short rainy season (December to March) occurs because the wind flows from Asia and the Pacific Ocean that contains a lot of moisture of rain. Climate conditions in this area were 5 wet months and 7 dry months with monthly rainfall of 276.7 mm and daily rain of 10.63/day [6].

3.3. Population and Livelihoods
Pakubaun Village had human population of 2,557 people. The population density in Pakubaun Village was 28 people per km². Most of the population in the study area are farmers. Agricultural activities are mainly carried out during the rainy season by relying upon field gardens as land for planting crops and only a small proportion of respondents who possess and cultivate rainfed land. Common crops planted in the fields are corn, cassava and beans. Meanwhile, annual crops such as coconut, jackfruit, banana, betel nut were planted in the home garden and agroforestry land. In addition to crops production, the farmers also raise livestock mainly cattle, pigs, goats, and chickens [6].

3.4. Characteristics of Respondent
The average age of respondent farmers was 48.6 years with a range of 23-70 years 28-64 years in the village. Based on the age structure, it can be considered that the respondents in the study area were categorized as productive farmers. Productive age ranges from 15 years to 64 years of age. Result of the study showed the average farming experiences of respondent farmers in rearing cattle was 6.9 years with a range of 4.0-37 years. The data illustrated that all respondents have good experiences in beef cattle husbandry. The average level of formal education of farmer was relatively low, where 67% of them did not complete primary school, 14% of respondents were graduated from Junior High School, 9.0% were graduated from High School, 4.0% were university graduates. This study showed that none of respondents attended any informal education in agriculture fields such as training in the field of animal husbandry. The dominant farming patterns practiced in the study area is dryland farming. Preparation of land for cultivation of the dryland farming is different from the wetland farming. Farmers in the dryland farming started preparation of land by cutting existing shrubs on the land and allowing to dry and then burning it. This practice is well known as slash and burn systems.

Average farm land owned by farmers was 1.42 ha with the arable land of 0.54 ha or about 35.21%. The dominant plant species cultivated by dryland farmers were maize, nasi beans (Vigna unbellata (Thunb.), turis bean (Cajanus cajan), green beans (Vigna radiata), pumpkin and cassava. The planting practices of dryland farmers were to plant more than one seeds in one hole. The mixed seeds were especially maize mixed with green beans, nasi beans, turis bean and pumpkins. This practice is locally known as salome means putting together more than one type of seed in one hole. Due to limited rainfall and short of rainy season, hence planting of all crops was done only once a year. The average production of food crops in the study area for one planting season of maize was 1,800 kg per ha, nasi beans 455.4 kg per ha, green beans 150 kg per ha year⁻¹. The priority use of the products was to meet their own family requirements for food, which reached 80% and the rest 20% were stored as seeds for the next planting season. Selling food crop product was rarely done by farmers, farmers would sell their food crops product when there was an emergency need of the family.

3.5. Cattle Husbandry in the Dryland Area
Raising cattle for the farmers in the rural areas of Pakubaun Village, Kupang Regency, is inseparable from farming activities. The culture of raising livestock, especially cattle has been considered as inheritance. There were diverse motivations and goals of respondents in rearing cattle, such as, (1) a source of income, which was expressed by 95.0% of respondents, (2) customs purposes (66.7% of respondents), (3) support the farm (90.5% of respondents), and (d) tradition (22.2%). The average number of cattle kept by farmers in the research area was presented in Table 1. Data in Table 1 showed that average number of cattle reared by respondents was same in proportion between males
and females both calf and adult cows. The cattle was still traditionally and extensively reared by farmers, where the cattle were grazed in pastures or forest lands during the day and at night the cattle were corralled. The owners had very low interference to their animals.

**Table 1.** Average number of cattle ownership by respondents based on sex and age group.

| Description        | Calf (AU) | Young (AU) | Adult (AU) | Total (AU) |
|--------------------|----------|------------|------------|------------|
| Male               | 2.50 (±1.78) | 2.60 (±1.75) | 3.12 (±1.90) | 8.22 (±3.58) |
| Female             | 2.24 (±1.26) | 3.09 (±2.00) | 4.12 (±1.26) | 9.45 (±4.19) |

(Source: Primary data, 2016).

However, rearing cattle management especially for male cattle has shifted in the last few years from extensive systems to semi-intensive systems in which cattle is tethered on a tree or placed in a very simple cage continuously in farmer’s home garden and fed with cut and carried leucaena leaf, grass and other leaves by the owners (cut and carry system). Utilization of inputs in beef cattle business in the study area was very low. The only main input given by farmers in the beef cattle business was labor mainly for collecting fodders from home gardens, fields and surrounding areas. While attention for the health care of cattle was very low. Allocation of family labor in the cattle business was high, especially during the dry season. Farmers had to collect fodders from forest or other rangelands area which were relatively far from their homestead or from where their cattle being tethered. Time allocation for different activities in rearing beef cattle by farmers was presented in Table 2. Data on Table 2 explains that most of time allocation by farmers was collecting and providing feed and herding the cattle. Of the total time available, more than half was used to collect fodders and herding the cattle. Farmers allocated only 12.56% of their time to provide water for the animal. It is understandable because water is very scarce and difficult to get in the area of study, then farmers prefer to give banana stem as a source of water for their cattle.

**Table 2.** Average labor utilization in cattle husbandry.

| Type of Activities                      | Time allocation (MD/month) |
|-----------------------------------------|---------------------------|
| Collecting feeds or fodders             | 17.14                     |
| Feeding and watering cattle             | 4.61                      |
| Herding                                 | 12.85                     |
| Health care and maintaining animal house | 2.10                      |
| Total                                   | 36.70                     |

(Source: Primary data, 2016).

3.6. Income analysis of beef cattle

Average household income from beef cattle sales in research area was presented in Table 4. Data in Table 3 indicates that farmer operated small scale beef cattle production. The average number of selling cattle was only 2.75 AU annually with gross revenue of Rp 17.9 million and net income of Rp 5.4 million including labor cost or Rp 3.25 million excluding labor cost.

It should be noted that labor for beef cattle production was fully from family labor, therefore in the case of net income calculation, it was not separated from total net income. In some cases for the purposes of economic analysis, this labor cost has to be calculated by applying opportunity costs. In this analysis, there are two ways to calculate the net income of beef cattle production namely with and without incorporating labor cost. Average net income of farm households from food crops and nonfarm activities was presented in Table 4.
Table 3. Average Household Income from Beef Cattle Sales in Research Area.

| No. | Categories                                      | Total income |
|-----|------------------------------------------------|--------------|
| 1.  | Number of sale (AU)                            | 2.75         |
| 2.  | Price per AU (Rp)                              | 6,500,000    |
| 3.  | Gross Revenue (Rp)                             | 17,875,000   |
| 4.  | Cost of buying stored bull (Rp)                | 12,375,000   |
| 5.  | Retribution Cost (village administration) (Rp) | 27,500       |
| 6.  | Buying rope (5 m)(Rp)                          | 67,750       |
| 7.  | Labor costs (Rp)                               | 2,158,200    |
| 8.  | Net Annual Income without labor cost (Rp)      | 5,404,750    |
| 9.  | Net Annual Income with labor cost (Rp)         | 3,246,550    |

(Source: Primary data, 2016)

Table 4. Average of Net Income of farm households from non beef cattle enterprise.

| No. | Categories                                      | Total            |
|-----|------------------------------------------------|------------------|
| 1.  | Net income of from food crops (Rp)             | 12,242,000       |
| 2.  | Net Income from Nonfarm activities(Rp)         | 2,612,500        |
| 3.  | Total (Rp)                                     | 14,854,500       |

(Source: Primary data, 2016).

Income from food crops derived from maize, beans, and cassava (tuber) products, while nonfarm income was derived from selling forest product such as tamarind pulp, and also selling lobster and fish. Collecting tamarind and caching lobster and fish is usually done during dry season.

3.7. Contribution of beef cattle enterprise on Household Income

Income analysis of farm households in the dryland area of Kupang Regency revealed that the average yearly farm household income was Rp 14.9 million. Yearly farm household income derived from beef cattle enterprise was Rp 5.4 million (without labor costs) and Rp 3.25 million (with labor costs). Thus, the contribution of local beef cattle enterprise to the total farm household income in the dryland area of Kupang Regency was 36.38% and 21.85% with and without incorporating labor costs in the analysis, respectively. This finding showed that the contribution of beef cattle income to the farm household income in the dry land area, Kupang Regency was slightly higher than the results of the study from B Hartono and E S Rohaeni [7] about the contribution of beef cattle to the traditional household income in Tanah Laut Regency, South Kalimantan that is 15-26%.

4. Conclusions

Farmer respondents operated small scale farming with an average arable land ownership less than 1 ha and beef cattle ownership of 1-6 heads per household. Total annual income of the farm household in the dryland area of Kupang Regency was low. The farm household income was only Rp 1.25 million per month. This total income was below the Regency Minimum Wage of Rp 1.55 million. The contribution of local beef cattle enterprise to the household income ranged from 21.85 to 36.38%. We suggested that in order to improve the welfare of livestock farmers in dry land areas, the government and the various parties concerned with rural development need to make a plan of action in order to increase the productivity of dryland farming. These can be done through providing farmers access to the capital source, and empowering the role of animal extension worker to offer better services in beef cattle husbandry in general and especially in feed processing and fodder preservation.
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