The impact of sharing arrangement institution on beef cattle breeding performance in Kupang District, East Nusa Tenggara Province, Indonesia

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Abstract. The aim of this study was to analyse the impact of sharing arrangement systems to performance of beef cattle breeding. This research was conducted in Kupang Regency – East Nusa Tenggara Province, Indonesia. The study used multi stage cluster random sampling method to determine the sample area and respondents. The sample areas consisted of 2 sub-districts and 6 villages, while the total respondents were 117 people comprised 74 Participant Farmers (PF) of sharing arrangement systems (SAS) and 43 non-participant farmers (NPF). 23 investors were selected for the survey. The result of the study indicated that the performance of NPF in terms of revenue, net profit, and return on investment (ROI) was better than PF respondents. The value of ROI was between 16.69–32.23 %. This indicated that utilization of farm asset was not optimum yet. It was found that farm efficiency was 1.73 which indicated that SAS does not increase farm productivity.

1. Introduction
Livestock production is an important part of agricultural sector which contributes to Gross Domestic Product (GDP) of Indonesia, and to the Indonesian overall economy. It also plays a vital role in many different aspects of people daily life, such as ensuring food security, providing nutrition, generating income and savings, and in many other social and cultural functions. Beef cattle play a significant role in the livelihood of many smallholder farm people living in rural areas, particularly as their family source of income, nutrition and welfare. Indeed, most rural people rely on farming, in one form or another, as their main occupation [1]. Livestock subsector provides food in the form of animal protein for the people. As a source of animal protein, beef is expected to meet the nutritional needs of the people. Beef contains 10 kinds of amino acids and essential fatty acids especially conjugated linoleic acid which is beneficial for the growth of neurons in the brain that determines the level of human intelligence [2]. Currently, beef consumption in Indonesia continues to increase, but the increase was not offset by the addition of adequate production. This condition causes low contribution to the nationwide production of beef cattle and resulting in widening gap between demand and supply. One of the solutions to overcome this gap is to increase domestic beef production. It seems that these efforts will be constrained given that more than 90% of beef production in Indonesia is produced by small farmers with 2-3 cows per household farmers [3]. Downstream products of beef cattle have not been optimally processed to attain high added-value products. Therefore, strategic steps for beef agro-industries development using resource-based in East Nusa Tenggara (ENT) should be taken into
consideration. Beef cattle industry in ENT is categorized as small and medium-scale enterprises and use simple technology [4]. This leads to low production and irregular product quality in ENT [5]. This study aimed to analyze the impact of sharing arrangements systems on performance of beef cattle breeding in Kupang District, ENT, Indonesia.

2. Materials and Methods
This study was conducted in Kupang Regency, ENT Province, Indonesia. Multistage cluster random sampling technique was used to determine the location and respondents. The Selection of the research area began from districts level (Kupang Regency), and the sub-district level (there are two sub-districts, namely Amarasi and Fatuleu) and village level (for each sub-districts, three villages were selected). The sample was determined using proportional allocation [6] and 74 participant farmers and 43 non-participant farmers were selected. In order to validate data of participant farmers’ production performance, data from investors were used as a compare data. Three types of investors were involved in this study. They are local government, external private institution, and the internal private institution. There were 23 investors chosen to be interviewed. Comparison of the production performance of partipant farmers and non-participant farmers covered four performance variables, namely income, revenue, profits, and return on investment from participant and non-participant farmers using two-tailed test [7].

3. Results and Discussion
3.1. Revenue Sharing Arrangement Institution
The profit sharing arrangement institution among farmers and investors has been practiced for a long time. Majority (97.30%) of respondents stated that the profit sharing has been done for more than 5 years. The sharing commitment is in kind pattern. That is, the farmer gets one calf from every 3-5 births. In general, the contract agreement between farmers and government is made in written form. Meanwhile, agreement between farmers and private investors is in the form of unwritten agreement. Both government and private investors require farmer participants to form a group before hand in order to get the breeding cattle aid. The group leader is responsible for the performance of its members. The contract contains the scope of work, rights and obligations, duration, execution, refund, sale, sanction, force majeure, cancellation of the agreement, dispute settlement. Breeders' obligations include feeding, health control, cattle safeguards and mating arrangement. The main thing to remember is every member of participants has to distribute a calf from every 3-5 births to another member of the group. The duration of sharing arrangement is limited to 3-5 years. The farmers are expected to have "sufficient" numbers of livestock so that they may develop their own business. They do not have any rights in terms of husbandry technology transfer in this case, feeding and reproduction technology aimed to increase productivity. This indicates that the existing rules of revenue sharing arrangement are not optimal yet. Institutional elements such as jurisdictional boundaries and authority between stakeholders are clearly define and revenue sharing arrangement is running well although the agreement between participant farmers and private investors are not in written agreement. According to participant farmers, the incentive of participant farmers does not compensate their efforts. The implementation of such institutional elements may be closely related to: (1) market profile, as one of the characteristics of revenue sharing commodities. This means that, the products can be sold anytime and related to socio-economic and cultural factors in the research area. This is confirmed by T Olviana, D P Darmawan, I G A A Ambarawati, and L Sulistyowati [5], who reported that market profile determines the pattern of institutional production, (2) low socio-economic level resulted in weak bargaining position. This is related to the elements of bounded rationality of participant farmers as a consequence of their capacity to access crucial information such as information on technology, final market and how to regulate these factors on agreement framework of revenue sharing with other parties, (3) scarcity or no other alternatives and productive economic activities.
3.2. Performance of Beef Cattle Breeding farms

Performance indicators in beef cattle breeding consists of cash income (or inkind converted to cash value based on the price of cattle, revenue from value-added of capital (VAC), total revenues, net. Net profit (that’s value obtained by subtracting net income to transaction costs during a year and the value rate of return on investment (ROI). The data in Table 1 explained that the average net income (both cash and non cash) of participant farmer is lower than the average income earned by non participant farmers, and statistically there is a highly significant difference (P <0.01) in income earned between participant farmers and non-participant farmers. Data above also explain that revenue in sharing arrangement between farmers and government investors is more beneficial than revenue sharing arrangement between farmers and other investors. However, from institutional point of view, revenue sharing arrangement between farmers and government investors has several weaknesses such as the rule is loose, hence, the distribution of offspring (calf) to other group members is beyond the set schedule. This also related to low ability of government to monitoring and evaluation the systems.

Rules that have been regulated by both external and private investors are different. They are more assertive, hence, the revenue sharing is applied based on the agreement especially for breeding where 1 out of 3-5 births is belonged to participant farmers. On the other hand, non-participant farmers’ average revenues depends on the number of cattle that they have and this should be more than the average revenue received by the participant farmers. Table 1 summarised the analysis of the average variance score of performance indicators of beef cattle breeding in Kupang District, ENT.

The statistical test on performance indicator such as value-added capital (VAC) showed that only participant farmers funded by government that receive VAC. In contrast, VAC of beef cattle breeding funded by private investors is not shared to the farmers. This significant differences (P <0.05) where average VAC received by participant farmers is lesser than independent farmers occurs because of the numbers of beef cattle that they have. Performance indicators such as total revenue (TR) of both participant and non-participant farmers is a cash income or its equivalent plus VAC. The results of variance test on mean value of total revenue (TR) shows that there is significant differences (P <0.01) between participant farmers and non-participant farmers. Based on Tukey’s test, it reveals that TR of participant farmers funded by government is bigger than those who are funded by private investors (external and internal), but smaller than the TR of non-participant farmers.

The result of variance test on performance indicators such as net income is a difference between total income and production cost (especially calculated cost). It is clear that the differences is equal to the TR indicator. This also shows that the value of the calculated cost is relatively small and proportional, or does not differ by the type of farmers. In this calculation, the cost only includes health care fee (vaccine and medicince) which is partly covered by the participant farmers. For feeding cost and salary is not included as expenses because all workers are the farmers’ family. This means that those two production factors are not considered as a part of sharing arrangement systems. This happens because the farmers want to maintain investors’ trust in managing their assets. In addition, job or other business in this area is not available at all times so these two factors are economically invaluable.

| Indicator                  | Code | Average (Rp000) | F-test                      | Tukey-test                     | T-test |
|----------------------------|------|-----------------|-----------------------------|--------------------------------|--------|
|                            |      |                 | Among P1                    | Between P1 & M                 |        |
| Cash income (equal)        | P1   | 2,787.60        | **                          | **                             |        |
|                            | P2   | 1,733.75        | 1 vs 2                      | 1 vs 3 **                      | NS     |
|                            | P3   | 1,949.20        | 2 vs 3 **                   | 2 vs 3 **                      |        |

Table 1. The analysis of statistical test on average variance of performance between participant farmers and non-participant farmers.
|                | M           | 2 vs 4*                | 3 vs 4                |
|----------------|-------------|------------------------|-----------------------|
| **Added value capital** | **P1** 967.32 | 1 vs 2**               | 1 vs 3**              |
|                | **P2,P 3** 0 |                        |                       |
| **Total Income** | **P1** 3,774.93 | 1 vs 4*               | 1 vs 2**              | **
|                | **P2** 1,744.29 | 1 vs 3**               | 1 vs 3**              |
|                | **P3** 1,972.80 | 2 vs 3**               | 1 vs 3**              |
|                | **M** 4,962.56 |                        |                       |
| **Net Income** | **P1** 3,398.48 | 1 vs 2**               | 1 vs 2**              | **
|                | **P2** 730.37 | 1 vs 3**               | 1 vs 3**              |
|                | **P3** 798.91 | 2 vs 3**               | 1 vs 3**              |
|                | **M** 4,539.70 |                        |                       |
| **Net Profit** | **P1** 3,244.08 | 1 vs 2**               | 1 vs 2**              | **
|                | **P2** 613.33 | 1 vs 3**               | 1 vs 3**              |
|                | **P3** 700.67 | 2 vs 3**               | 1 vs 3**              |
|                | **M** 4,533.38 |                        |                       |
| **ROI**        | **P1** 28.29 | 1 vs 2**               | 1 vs 2**              | **
|                | **P2** 19.00 | 1 vs 3**               | 1 vs 3**              |
|                | **P3** 18.38 | 2 vs 3**               | 1 vs 3**              |
|                | **M** 38.94 |                        |                       |

Description: P1 = participat farmers funded by government, P2 = participants farmers funded by external private institution, P3 = participant farmers funded by internal private institution, M = non-participant farmers. tn = no significant differences, ** = significant differences.

The results of mean variance test on performance indicators in a form of net profit is the difference between net income and transaction costs. Based on Table 2, the mean variance among participant farmers is equal to the variance of other performance indicators as explaind above, where the variance among participant farmers is P <0.01, between participant farmers and non-participant farmers is P <0.01. The result of Tukey test also indicates that the average net profit of farmers funded by government is bigger than the average net profit (NP) of participant farmers funded by external and internal private investors as well as the mean average NP of non participant farmers is bigger than NP of participant farmers (P <0.01). In terms of performance indicators, the result of mean variance test on return of investment describes to what extent the investment can be returned in a particular
production period. Table 2 which shows the result of F-test indicates that there is a significant difference (P <0.01) in terms of return of investment among participant farmers, between participant farmers and non-participant farmers. Later on, Tukey test also shows similar result among participant farmers (P <0.01), as well as the comparison of the average ROI between participants farmers and average ROI of non-participant farmers (P <0.01).

The value of ROI on beef cattle breeding is high, which ranging between 18.38 to 38.94 %. Although this result is different with C Firmansayah, S Kuswaryan, and S Rahayu [8], who reported that ROI is 14.91 % only. This means that value of return investment is higher than annual commercial interest rates (16-18 %). Actually, ROI value on community beef cattle breeding in this study show minimal use of asset of beef cattle breeding, especially those owned by participant farmers. In other words, the resources should be more optimized in order to increase the income of participant farmers. This is in accordance with the request of the majority of participant farmers that they need to increase the number of livestock so that the opportunity to develop their own business is greater. This is because it is supported by the availability of labor and land as a source of forage/feed. The net profit earned by participant farmers especially those who shared the revenue with external and internal private investors was very low. However, based on the interview with respondents, most of them prefer to continue this business with private investors. This is most likely related to the flexibility of the rules. This means that when the farmers have emergency need, they may get loan from investors that have equal value to the cattle that they are entitled to in the coming months. This kind of rules leads to produce patron client relationship between investors and participant farmers. In addition, the sales activity is also flexible where the cattle can be sold at any time within a year, and at any age.

Above explanation indicates that revenue sharing arrangements does not prove significant impact on the productivity of beef cattle breeding. These results are similar to the finding of A Fujimoto [9], who reported about the role of contract farming. These two research show that there is no effect of tenure status as an elements of revenue sharing on rice productivity. This is different from the results obtained by O H Nono, M Yunus, and S A Adutae [10] who reported the performance indicators of agriculture on the irrigated area which include: total revenues, net income, net profit, R/C, and the value of return on investment / ROI. In this case, the performance of pawner and tenants better than the performance of owners and farmers. This facts do not indicate that the revenue sharing arrangements is not needed in business development. This occurs because farmers normally have several major limitations such as capital, access on science and technology or access to markets (input and output). Thus, revenue sharing arrangements provides an opportunity for farmers to be able to optimize their resources so as to obtain additional income. It is asserted by O H Nono and S A Adutae [11] that the performance of agriculture businesses (variety of crops, livestock and plantations) is determined by the capacity of organizations and institutions in addition to other factors.

4. Conclusions
a. The performance of non-participant sharing arrangement business is more profitable than the profit earned by participant farmers.

b. Revenue sharing arrangements has not increased farms/business productivity yet. However, the existence of sharing arrangement of breeding cattle business provides an opportunity for farmers and their families to optimize resources (land and worker) usage which in turn increasing their income.

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