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Factors Influencing Beef Cattle Farmers' Participation in Profit-Sharing System

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ABSTRACT

One type of livestock business in several of Indonesia's rural areas is the profit-sharing beef cattle farming system, where investors and livestock keepers share the profits. This profit-sharing scheme is known as the *teseng* system in South Sulawesi Province. This study aims to determine whether the availability of capital, land area, business scale, age, income, and the number of family dependents affect beef cattle farmers' utilization of the *teseng* profit-sharing system in Temmabarang Village, Penrang District, Wajo Regency, South Sulawesi Province of Indonesia. The type of research used was a descriptive and explanatory research method. Technique sampling was done by simple random sampling with 90 respondents. The data was obtained and analyzed using a well-structured questionnaire and a binary logistic regression model. The results showed that the factors that significantly affected farmers' participation in the *teseng* system were the availability of capital, business scale, age, and income. In contrast, the factors that had no effect were the variable perceptions of land area and the number of family dependents.

Keywords: beef cattle, capital, income, profit-sharing, *teseng*

INTRODUCTION

Nowadays, in Indonesia, the demand for beef continues to increase along with population growth and improving economic levels. This creates an excellent opportunity for beef cattle farmers to generate a profitable income. A livestock commodity with significant potential is beef cattle. Beef cattle are one of the ruminants that have substantial roles in fulfilling producers' and food needs for animal protein sources. However, in Indonesia, meat consumption still exceeds the amount of beef cattle produced [1]. In 2021, beef production was 487.8 thousand tonnes [2], and Indonesia's consumption of beef and buffalo meat is projected to be 696.96 thousand tonnes, with a population of about 272 million beef [3]. The shortage between supply and demand for beef is rising [4]. Indonesia's economy and population development are the leading

causes of the rising need for animal food sources [5]. Livestock business development in Indonesia aims to improve food security and increase people's purchasing power through improved income. To achieve these objectives, the strategy is to enhance active community participation, encourage investment in rural livestock enterprises, and empower farmer-livestock communities. According to Rusdiana *et al*. [6], farmers can improve their income by growing beef cattle and raising the community's purchasing power to meet its demands.

Accordingly, some farmers need to have access to funding to grow their beef cattle businesses. The profit-sharing scheme is a viable option for the community, as many people wish to raise cattle but are limited financially [7]. Price contracts, build-to-takeover, profit-sharing, and cage renting are the typical partnership patterns in raising beef cattle, with profit-sharing patterns being more prevalent [8]. A Profit-sharing system in beef cattle farming is seen as more efficient and equitable than risk-shifting methods, as it allocates investment funds based on expected profitability, incentivizing entrepreneurs [9]. The profit-sharing system in Indonesian beef cattle raising faces challenges like inadequate infrastructure, limited resource access, a lack of farmer awareness, and the need for proper governance and regulation [10]. Specialized actions and policies are required to overcome obstacles and encourage the implementation of the profit-sharing system [11].

The profit-sharing system is widely applied in the Indonesian region [7], [12], [13], [14], [15], [16]. One of the traditional Wisdom that the people of Indonesia, particularly those in South Sulawesi, have been practicing for many generations is the *teseng* profit-sharing system. The livestock owner manages the traditional profit-sharing system (*teseng* or *gaduh*), which involves assigning the livestock to partner partners who raise it based on confidence without a contract [13]. There are several reasons why farmers and capital owners use the *Teseng* profit-sharing system. The main factors for farmers (*Pa'Teseng*) doing profit-sharing are lack of capital, wanting to own livestock, economic demands, family requests, and additional income. The capital owner (*Ma'Teseng*) implemented the profit-sharing system primarily due to several factors, including insufficient time for maintenance, a desire to assist others while maximizing profits, a shortage of land, and an excessive number of livestock [17]. Previous studies have demonstrated that the number of cows owned, income, profit-sharing structure, land ownership, and the number of calves produced were the factors that affected the motivation of beef cattle farmers operating under profit-sharing schemes [18]. Next, the profit-sharing framework in the beef cattle industry is significantly impacted, individually or at once, by farmers' economic and social conditions [19].

Wajo Regency is among the regencies in South Sulawesi where there has been a rise in beef cattle. The population of beef cattle in Wajo Regency has been rising annually. According to data from the Central Bureau of Statistics of Wajo Regency [20], 116,518 heads were recorded in 2017 and increased by 123,722 in 2018, yielding an average increase of 7,204. According to Satu Data dan Informasi Kabupaten Wajo [21], the number of beef cattle in the Wajo Regency has increased up to this point, totaling 133,539 heads in 2020. Accordingly, most people in Temmabarang Village, Penrang District, Wajo Regency are full-time or part-time livestock farmers. The beef cattle population was 920 heads, making up 36.30% of the total livestock raised by the community.

Based on observations made at the study site, the *teseng* profit-sharing system has been used by many farmers to run their livestock businesses. Farmers who want to be entrepreneurs but need more capital and those who have capital but need more time to raise livestock engage

in livestock businesses using profit-sharing arrangements. The results of a study indicate that to improve the welfare of cattle breeders, a profit-sharing program that seeks to improve the quality of farmers and their unique characteristics, as well as the connections among stakeholders, is necessary [22]. Further, according to some earlier research, several factors affect farmers' involvement in a profit-sharing system. Adoption of the profit-sharing system is influenced by land size and the quantity of animals owned, while perception, age, and family size have no effect [13]. Another study shows that farmers' ownership of farming land, the number of calves produced, the amount of income from non-breeding cattle, and the number of livestock owned significantly affect the profit-sharing arrangement [18]. Next, a profit-sharing scheme's adoption rate is influenced by several factors, including business capital, farm revenue, land acreage, trust, cooperation, and norms [12]. Accordingly, this study investigates the factors influencing beef cattle farmers' decisions to implement the *teseng* profit-sharing scheme in Temmabarang Village, where certain farmers still implement the teseng *system*. These factors include capital availability, land size, business scale (number of cattle owned), age, and income.

MATERIALS AND METHODS

Study Area

This research was conducted in Temmabarang Village, Penrang District, Wajo Regency, South Sulawesi Province, Indonesia, from November to December 2022. Penrang district consists of nine villages, including Temmabarang Village and one sub-village. The community is situated 8 km west of Penrang Sub-district's capital.

The map of the study area can be seen in Figure 1 [23].

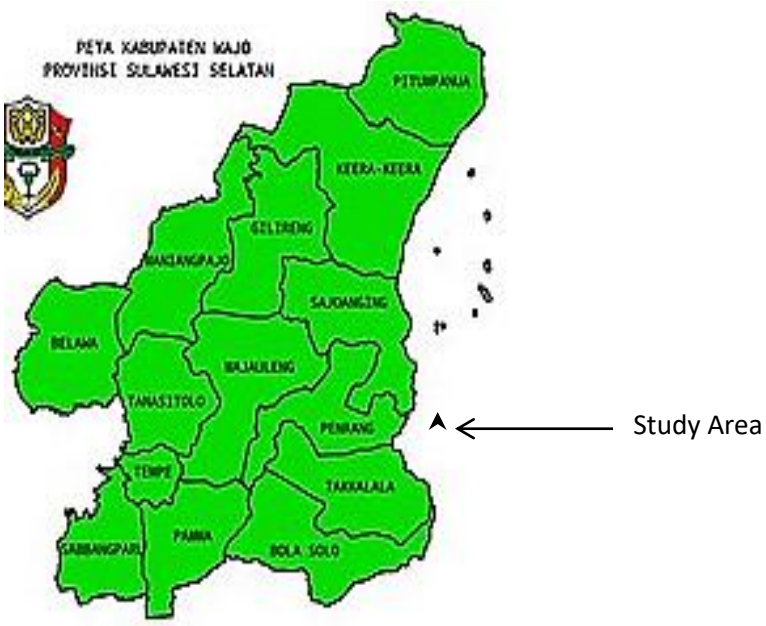

Figure 1. Map of Study Area

Population and Sample

The population comprised beef cattle farmers in Temmabarang Village, Penrang District, with 163 farmers. In contrast, beef cattle farmers who used the profit-sharing system (*teseng*) amounted to 84 farmers, and those who did not use the system were 79. Using the Slovin formula [24], the number of samples in this study was 46 farmers who used the *teseng* system and 44 who did not, which were taken randomly. The Slovin formula is as follows:

$$n = \frac{N}{1 + N.e^2}$$

Where:
e = error (10%)
N = total population
n = total sample

The number of farmers who applied *teseng*:

$$n = \frac{84}{1 + 84\ (0.1)^2} = \frac{84}{1 + 84\ (0.01)}$$
$$= 45.65 \approx 46\ respondents$$

The number of breeders who did not apply *teseng*:

$$n = \frac{79}{1 + 79\ (0{,}1)^2} = \frac{79}{1 + 79\ (0{,}01)} = \frac{79}{1{,}79} = 44.13 \approx 44\ respondents$$

Data Analysis

The analytical method used was binary logistic regression to measure the factors influencing farmers to participate in the *teseng* profit-sharing system. A mathematical model of binary logistic regression can be written as follows [25]:

$$\text{Log}\left(\frac{p}{1-p}\right) = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X + E$$

Whereas,
p = The probability of a farmer doing *Teseng* has a value of Y = 1, otherwise Y = 0
β1, β2, β3, β4, β5, β6 = Regression Coefficient of Variable X1, X2, X3, X4, X5, X6
X1 = Capital Availability (score: 1 = unavailable, 2=limited, 3=available)
X2 = Land Size (hectares)
X3 = Business Scale (number of cattle owned) (Head)
X4 = Age of Respondent (years)
X5 = Income (IDR)
X6 = Family Size

The SPSS software was used to process the data.

RESULTS AND DISCUSSIONS

Characteristics of Respondents

The characteristics of respondents are essential to explain. Discussing the farmers' socio-economic characteristics will help explain how to enhance farming practices better [26]. This study had 90 respondents. The characteristics analyzed were age, education level, length of farming, income, family size, land size, and occupation. Table 1 presents the characteristics of the respondents in this study.

Table 1. Characteristics of Respondents

Variables	Number (Person)	Percentage (%)
Age (Years)		
23 – 31	10	11.1
32 – 40	8	8.88
41 – 49	21	23.33
50 – 58	30	33.33
59 – 67	19	21.11
68 – 76	2	2.22
Education Level		
Primary School	68	75.55
Junior High School	8	8.88
Senior High School	13	14.44
Undergraduate	1	1.11
Length of Farming (Years)		
1-7	55	61.11
8-14	21	23.33
> 15	14	15.56
Income (IDR/year)		
1,000,000 - 7,000,000	18	20
8,000,000 - 14,000,000	8	8.89
> 15,000,000	64	71.11
Family Size (Person)		
0 – 2	29	32.22
3 – 5	57	63.33
> 6	5	4.45
Business Scale (Head)		
1 – 7	5 5	61.11
8 – 14	21	23.33
> 15	14	15.56
Land Size (Hectares)		
> 0.5	11	12.22
0.5 – 1	41	45.56
> 1	38	42.22
Occupation		
Labour	1	1.11
Housewife	4	4.44
Employee	2	2.22
Farmer	75	83.33
Self-employed	8	8.89

The income level of respondents was generally above IDR 15,000,000 per year (71.11%). Accordingly, there were several ways to increase farmer income: raising more cattle, strengthening government support, raising cattle of higher quality and having ancestors of traceable origin, feeding cattle based on need, using concentrate or supplement feed, improving cage conditions, and maintaining adequate sanitation [27]. There were 57 farmers (63.33%), with family members of between 3 and 5 people. The business scale was generally small, with 1 and 7 cows, which largely had a land area between 0 and 1 hectare with 41 farmers (45.56%). In Indonesia, household farming remained the primary practice for raising cattle, whereas modern business principles still needed to be used in small-scale home cattle businesses [28].

Implementation of the *Teseng* Profit-Sharing System

The *teseng* profit-sharing system is a trust-based agreement between livestock owners and keepers. Unlike the government-implemented profit-sharing system, the teseng profit-sharing system has no requirements. Therefore, it is widely used by the community and is considered very beneficial for farmers and livestock owners [29].

The profit-sharing system (*tesang*) already exists in the lives of farmers in Temmabarang Village, Penrang District, Wajo Regency. The local community has implemented this system, and it has been rooted from generation to generation, although in its development, it has undergone several adjustments in the distribution method. Based on mutual trust plus customary law that supports the application of the *teseng* system, this system will last a long time in the life of the local community.

Several things need to be considered in the application of the profit-sharing system in Temmabarang Village, Penrang District, Wajo Regency:

- Mutual trust is necessary between the owner and the breeder. Since this method usually does not involve a written agreement. All agreements are made verbally between the breeder and the owner.
- Cattle owners typically consider several factors before giving their animals to a well-known individual, including farming expertise and techniques. For ease of monitoring, the animals are entrusted to the farmer, family members, or those who reside near the owner's residence, for instance.
- Farmers have land that can be used to grow forage, or in their area, the availability of forage is sufficient to meet the needs of livestock feed.

The *teseng* profit-sharing system agreed upon by both parties by farmers in Temmabarang Village is as follows: (1) For cattle given by the owner to the farmer to be kept, it is a mature female cow or a female cow that has given birth. The system is that in the first year, the calf is given to the owner, the second calf in the second year is given to the farmer, and so on. (2) For cows given by the owner to the farmer for maintenance, there are mature female cows or female cows that have given birth. The system is that in the first year, the calf is given to the farmer, the second calf in the second year is given to the owner, and so on. (3) For feeder cattle, two cows are given by the owner to the farmer. There are two distribution patterns in this pattern: first, when the two mother cows give birth, they are given entirely to the owner; second, to the farmer; and so on. (4) The feeder cattle given by the owner is bulls. The sharing system means that when the initial capital is sold, it is given to the farmer. The advantage is that it takes little time to

breed and can be sold, but the profit is less than the profit-sharing method in methods 1, 2, and 3. According to Hardaryanti *et al*. [12], the capital owner and the farmers claim that there is no formal agreement between them; instead, kinship is given priority, sometimes leading to less beneficial outcomes for the farmers.

Omnibus Test of Model Coefficients

The Omnibus Test of Model Coefficients is a statistical test used in logistic regression to determine the model's relevance by assessing the relationship between predictor factors and response variables [30]. Accordingly, determining whether the model is statistically significant overall is made easier with the help of the p-value associated with this test. The Omnibus test statistic is distributed according to a chi-squared method. The null hypothesis is refuted by the evidence of a lower p-value, typically less than a chosen significance level, such as 0.05. It suggests that at least one of the predictor variables in the model is connected to the response variable. In this study, the results of the Omnibus test analysis can be seen in Table 2.

Table 2. Omnibus Test Coefficient Model

		Chi-square	Df	Sig.
Step 1	Step	75.972	6	.000
	Block	75.972	6	.000
	Model	75.972	6	.000

From Table 2, Chi2 = 75.972 with significant (sig.) = 0.000, because $\alpha = 0.05 >$ sig. = 0.000, at least one independent variable affects the model. The significance column shows a value of 0.000. This implies that the model effectively fits the data, demonstrating that the predictor variables provide valuable information for outcome prediction.

Hosmer-Lemeshow Test

The Hosmer-Lemeshow Test is a statistical test used to assess the fit of a logistic regression model to data. It compares observed and expected frequencies, with a high p-value indicating good fit and a low p-value indicating insufficient fit [30].

Table 3 displays the results of the model fit test using the Hosmer and Lemeshow Test.

Table 3. Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	9.083	8	.335

In Table 3, the Hosmer and Lemeshow Test in the significant column shows a value of 0.335 greater than Alpha 5%, so we accept the null hypothesis (statistically, there is no significant difference between the model and the observed value) because $\alpha = 0.05 <$ sig. = 0.335 means that the model can sufficiently explain the data; in other words, at the 76% confidence level, the binary logistic regression model used can relatively explain the data.

The Binary Logistic Regression Estimation

This study used binary logistic regression to estimate several factors as independent variables, namely capital availability, land size, business scale, age, income, and family size, on the opportunity of farmers to join the *teseng* profit-sharing system, which was referred to as the dependent variable. Table 4 displays estimates of the factors influencing farmers' adoption of the *teseng* profit-sharing scheme.

Table 4. The Binary Logistic Regression Estimation

Parameters	Coefficient	Standard error	Wald	Odds Ratio Exp(B)
Capital availability	-5.050***	1.271	15.794	.006
Land Size	.059	.239	.061	1.061
Business Scale	-.129**	.067	3.694	.879
Age	-.220***	.059	14.113	.802
Income	.042**	.018	5.425	1.043
Family Size	.512	.371	1.901	1.668
Constant	22.253***	5.083	19.170	4617240185
Hosmer and Lemeshow Test	.335 (sig)			
	9.083 (chi-square)			
Nagelkerke R Square	.760			

Note: *** and ** significance at $p<0.01$ and $p<0.05$ respectively.

The Hosmer and Lemeshow tests are a general method for determining the goodness-of-fit of logistic regression models. Table 2 evaluated the suitability of the logistic regression model (goodness of fit) for prediction using the Hosmer and Lemeshow Chi-square test. The Hosmer and Lemeshow Test showed a value of 0.335, more significant than Alpha 0.05, so we accepted the null hypothesis (statistically, there was no significant difference between the model and the observation value), meaning the logistic model could sufficiently explain the data. Additionally, the chi-square was more significant than .05, at 9.083. Consequently, since there was no apparent distinction between the observed and predicted classifications, the logistic regression model can be approved with further examination [31]. The Nagelkerke R square value of 0.760 indicated that 76 percent of the independent variables collectively influenced the dependent variable and were explained by the model; factors outside this scenario caused an additional 24% of the variance in variable Y.

The odds ratio is a proxy for a person's propensity to participate in an activity or not [32], [33]. The odds ratio represents the probability of condition 1 (doing profit sharing) versus condition 0 (not doing profit sharing). The odds value measures farmers' likelihood to select choice 1 (using the *teseng* system). Farmers have a better chance of choosing to implement the *teseng* profit-sharing system if the odds value is higher.

As can be seen from the results, four independent variables significantly influenced the probability of farmers using the profit-sharing system: capital availability, business scale, farmer's age, and income. The capital availability was negative and statistically significant. This showed

that the availability of capital had a significant relationship with beef cattle farmers who use the *teseng* profit-sharing system. This implied that farmers were likelier to choose the *teseng* system when they lacked the capital necessary for raising cattle. This is in line with the study of [34], which found that a partnership system for beef cattle has emerged in Indonesia due to the restricted access to capital faced by the nation's low-income small-scale farmers. The odds ratio value showed that farmers who do not have access to capital had 0.006 times the probability of participating in the *teseng* program. The result indicated that the *teseng* program is still needed, especially for farmers who do not have capital.

The binary logistic regression estimation revealed that the business scale had produced statistically significant adverse outcomes. This demonstrated that the smaller the livestock owned, the more the farmer wanted to use the *teseng* profit-sharing system. This was consistent with the findings of the Prasetyono *et al*. [35] study, which showed that livestock contributed more to household income as businesses scaled up and that the development of a profit-sharing system was feasible. The odd ratio value showed that farmers with small livestock had 0.879 times the probability of participating in the *teseng* program. The income variable indicated statistical significance and was positive. The results were based on the study by Hardaryanti *et al*. [12], which found that income significantly influenced adopting the profit-sharing system. The odd ratio value explained that farmers with more income had a 1.043 times greater probability of participating in the *teseng* program. This implied that farmers raising beef cattle would participate in the profit-sharing scheme to a greater extent as life's necessities increased.

This research demonstrated an adverse and statistically significant result for the age variable. This suggested that older farmers were less likely to participate in the profit-sharing system. The study of Baba *et al*. [13] showed the same result. The survey of Awotide *et al*. [36] also revealed that younger farmers were more likely than older farmers to be involved in cooperative organizations due to the statistically significant and negative age coefficient. Younger farmers were more likely to adopt new technologies and practices, which led to higher productivity and profitability. Gia Hung [37] showed that age was inversely correlated with beef cattle farmers' adoption of good agricultural techniques. Accordingly, age influences a farmer's labor and perception while choosing the form and structure of livestock farming management. Farmers' productivity will decline as they get older. Farmers' productivity ranges from 15 to 56 years old, and age significantly impacts their ability to work [38]. Age is one of the essential variables to be analyzed for its influence. Another study showed a significant correlation between farmer age and sustainability metrics related to the economy, environment, and society. There was a negative correlation between a farmer's age and yield per hectare, gross margin per hectare, farm family earnings, and farm sustainability [39].

CONCLUSIONS

Based on the findings and discussion of the research, it can be concluded that the factors influencing beef cattle farmers to carry out a profit-sharing system were the availability of capital, business scale, age, and income. Younger farmers typically chose to participate in the *teseng* profit-sharing scheme. As such, the government's assistance for youth needs to be strengthened.

It is envisaged that the increased number of youths employed in the cattle industry will boost economic growth and beef self-sufficiency.

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