



Empowerment Strategy for Bojonegoro Smallholder Cattle Farmers towards Red-Meat Agribusiness Sustainability

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Abstract. The program for the development of smallholder beef cattle farming businesses aimed at increasing national beef production through various development activities and approaches. Community empowerment is a process of social change that essentially enhances mode for implementing livestock development programs and activities. The objective of this research is to analyze the achievement of the on-going empowerment efforts for smallholder beef cattle farmers in Bojonegoro. Data collection was conducted through surveys using structured questionnaires, observations, and documentation of smallholder cattle farming households in Tambakrejo District, which represents the typology of a beef cattle breeding center. Data analysis used a descriptive method with a quantitative approach. The results showed that the empowerment of smallholder cattle farming households cannot be adequately assessed solely based on the livelihoods status indicators of cattle farming households, which consist of five types of capital : (a) Human Capital, (b) Natural Capital, (c) Financial Capital, (d) Physical Capital, and (e) Social Capital. It is also necessary to include the components of household resilience and household dynamism. Together, the components of the livelihoods-status of smallholder cattle farming households, household resilience, and household dynamism form the empowerment of smallholder beef cattle farming households.

Keywords: beef cattle, community, human capital, sustainability.

1 Introduction

Global demand for beef has escalated in recent decades, driven primarily by population growth, rising household incomes, and increasing awareness of the importance of animal based protein for enhancing human resources quality.

Between 1963 and 2015, global meat production nearly quadrupled from 78 million to 331 million tons of which around one quarter is contributed by cattle, sheep, and goats [1]. Forecasts by the OECD/FAO predict a further 19% increase in global meat production by 2025, with developing countries accounting for nearly 78% of this growth [2]. As incomes improve, consumers increasingly seek high quality protein

sources, thereby placing additional pressure on national livestock sectors to balance domestic production with rising demand.

In Indonesia, this pressure has become evident since 2013, when domestic beef consumption began to surpass local production levels. Over the period from 2013 to 2015, the domestic production deficit totaled approximately 130,050 tons, and current trends suggest that this gap will continue to widen [3].

By 2020, Indonesia's local beef cattle production only meets 58% (403,668 tons) of national demand, requiring imports of feeder cattle and frozen beef to cover the shortfall [4]. A key contributing factor to this reliance on imports is the uneven distribution and declining population of nationally owned beef cattle [5].

Smallholder beef cattle farming practiced by over 5 million households and particularly concentrated in East Java Province plays a significant role in the national livestock landscape [6]. However, these smallholders often have limited access to productive resources, making it challenging for them to enhance output and reduce dependency on imports.

Addressing these challenges requires strategic interventions aimed at strengthening the capacity and resilience of smallholder beef cattle farmers. Empowerment programs have emerged as a critical component of contemporary rural development strategies, providing farmer households to gain improved access to productive inputs, knowledge, and market networks [7]. Although various development initiatives have been introduced, few studies have systematically examined household level empowerment strategies measures in the context of smallholder beef cattle production, particularly in Indonesia.

This study aims to develop and evaluate an empowerment framework for smallholder beef cattle farmers, with the specific objective of improving their production capabilities, resource access, and overall economic resilience. In doing so, it seeks to contribute new insights into the design and implementation of targeted empowerment interventions, thereby strengthening the local livestock sector ability to meet growing national demand. Uniquely, this research does not only evaluate the existing conditions but also provides a structured approach to household level empowerment, incorporating socio-economic, institutional, and policy dimensions. By presenting a novel model tailored to Indonesian smallholder contexts, this study offers a fresh perspective on overcoming supply constraints, promoting sustainable growth, and reducing dependence on beef imports.

2 Materials and Methods

2.1 Time and Location

This research was conducted over a three-month period, from June until August 2024, in Bojonegoro Regency, East Java, Indonesia. Bojonegoro Regency was selected purposively because it is recognized as one of the largest beef cattle breeding and fattening centers in East Java. Within this regency, Tambakrejo District was selected because of it has a particularly high beef cattle population, making it a suitable area for studying both breeding and fattening typologies of smallholder beef cattle farms.

2.2 Sampling Method

The study population comprised 1,397 smallholder beef cattle farmer households in Tambakrejo District. A sample size of approximately 14% of the total population (200 households) was determined based on considerations of logistical feasibility and accessibility to respondent locations. The sample of farmer households was selected using a purposive sampling method. Selection criteria included: (1) having raised beef cattle for at least three consecutive years, and (2) considering beef cattle farming as the main livelihood. Secondary data from the local livestock service office and farmer group records provided initial guidance for identifying potential respondents.

2.3 Data Collection

Primary data were collected through a household-level survey using structured questionnaires. Data collection activities included direct observation, face-to-face interviews, and documentation review. Interviews were conducted with the household members directly responsible for livestock management. Secondary data, such as regional livestock population statistics and farm management guidelines, were obtained from government documents, livestock service office reports, and relevant literature.

2.4 Variables and Measurements

The variables examined in this study included:

- Household Socio-Economic Characteristics: Age, education level, household size, primary income sources, and farming experience (measured in years). These variables were measured using discrete scales (e.g., years of experience, number of household members) or categorical classifications (e.g., education level).
- Farm Management Indicators: Herd size (number of cattle owned), production systems (breeding, fattening, or mixed), feeding practices (type and frequency of feed), and access to veterinary services. Herd size was measured by counting individual animals at the time of the survey. Management practices were recorded through binary or categorical responses (e.g., “yes/no” for veterinary access, and “breeding/fattening/mixed” for production system).
- Empowerment and Resource Access Indicators: Access to credit, participation in training programs, membership in farmer groups or cooperatives, decision-making autonomy in farm management, and market access. These indicators were measured using Likert-type scales (e.g., 1 = strongly disagree to 5 = strongly agree) to assess perceptions of empowerment and resource availability.
- Productivity and Economic Outcomes: Annual cattle sales (in number of heads sold), income derived from cattle farming (in local currency), and household profitability estimates. Productivity and income data were collected based on respondents’ records and recall.

2.5 Data Analysis

Data analysis combined descriptive and quantitative approaches. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to characterize the

socio-economic status of households, farm management practices, and empowerment levels. For empowerment and resource access indicators, average scores and distribution patterns were analyzed. Where relevant, comparisons were made between of different household groups (e.g., breeders versus fatteners, high versus low resource access) were performed. This approach provided for an indepth understanding of existing conditions, facilitating the development of targeted strategies for enhance household empowerment level and improve beef cattle production.

3 Results and discussion

3.1 Farmer Characteristics of Smallholder Beef Cattle Business

Farmer Characteristics Based on Age, Education, and Livestock Experience.

Farmer characteristics are one of the aspect that influence successes of running livestock farming. The ability possessed by a farmer to manage the livestock business will indirectly affect livestock productivity. Farmer characteristics in this study are shown in **Table 1**.

Table 1. Farmer’s individual characteristics.

No.	Description	Category	ΣRT	(%)
1.	Age of farmers	1. ≥ 61 years	8	4.0
		2. 51-60 years	36	18.0
		3. 41-50 years	68	34.0
		4. 31-40 years	57	28.5
		5. ≤ 30 years	31	15.5
2.	Formal education level	1. Not completed in elementary school	33	16.5
		2. Graduated from elementary school or similar	83	41.5
		3. Graduated from junior high school or similar	69	34.5
		4. Graduated from high scool or similar	14	7.0
		5. Graduated from Academy/College	1	0.5
3.	Livestock experience	1. Less than 4 years	11	5.5
		2. 5 years s/d ≤ 6 years	31	15.5
		3. 7 years s/d ≤ 10 years	70	35.0
		4. 11 years s/d ≤ 14 years	56	28.0
		5. ≥ 15 years	32	16.0

According to Table 1, most of them (34%) were in the ages of 41 to 50 years, followed with farmers between 31-40 (28,5%). Around 56 Percent of farmers were older than 40 years old. Given that indicates that most farmers are older, while only about 54% of

farmers were under 40. The theory of innovation adoption states that older target groups are slow to accept innovations, and some even reject them. Data above shows that senior farmers over 51 years old make up 22 Percent of the total, compared to 15.5% of younger farmers under 30. It seems that some young individuals have little interest in becoming beef cattle farmers, which is a common occurrence in agriculture in general. There are five categories comprise the formal education of beef cattle farmers from the not completed from elementary school until graduated from an academy or college. Data above shows that the education level of farmers in Dolokgede village in the largest category, with 41.5% is graduating from primary school or equivalent and 34.5% graduates from junior high school. Farmers in this village is in the category of junior high school graduates and below are 92.5%, while the rest (7.5%) are farmers whose education is senior high school and above. The educational attainment of farmers, as well household members, affects the willingness of farmer households to participate in efforts to improve household empowerment in rural communities in general [8]. It has been found that the more farm households have relatively high educational attainment, the higher the willingness to participate [8]. This is because the level of household awareness of the need for knowledge and technology and innovation in agriculture increases.

Farmers' experience in beef cattle farming is quite long and has been passed down from generation to generation [9]. Farming experience average length by farmers is 8 years. In facts, round 79 percent farmers have bred beef cattle for more than 7 years. Farmers' expertise or length of farming are an asset to growing their business, but it may also be a barrier to implementing some advances. Farmers who have been in the beef cattle industry for a long time or who have a lot of expertise may believe they know enough to be less sensitive to new technologies [10]. Approximately 21% of farmers are new to the industry and have been in business for four to six years. In turn, these farmers must rapidly expand their knowledge of their beef cattle farming skills to improve their business and improve the welfare of their families through beef cattle farming.

Farmer Characteristics Based on Land Use and Average Revenue. Table 2 shows the results that (1) Most farmer households are maintain about 2 to 3 Livestock Units; (2) The mode of employment '*maro*' (33%) is pursued by farmer households, in addition to maintaining a cow owned by themselves (27.5%); (3) Most (93.5%) beef cattle farmer households utilize the land owned or controlled to grow food crops, such as corn or cassava, some in a mixture with planting vegetable beans (*Vigna sinensis* (L.) Savi ex Hassk.); and (4) Most (93%) smallholder beef cattle farmers receive no more than Rp. 5 million from their cattle business in a year, while around 7% or 14 cattle farmer households reported receiving more than Rp. 5.1 million from their cattle business in a year.

Table 2. Farmer characteristics based on land use and average revenue

No.	Description	Category	ΣRT	(%)
1.	Land use	1. Not utilized	5	2.5
		2. Utilized for food crops	50	25.0
		3. Utilized for food crops and vegetables	83	41.5
		4. Utilized for food and mixed crops ≥ 0.25 ha	54	27.0
		5. Utilized for food and mixed crops ≥ 0.30 ha	8	15.5
2.	Average revenue from cattle business per year	1. Very small	32	16.0
		2. ≥ 3 million	97	48.5
		3. $>3,1$ million, untill ≤ 4 million	37	18.5
		4. $>4,1$ million, untill ≤ 5 million	20	10.0
		5. >5 million	14	7.0

Integrative farming-livestock practices seem to have been implemented by the agrarian community Tambakrejo District and in another areas in Indonesia. Crops-livestock systems seem to be constantly promoted in low-income countries around the world to implement sustainable development through the movement of sustainable agricultural practices that are believed to help them address socio-economic, energy and environmental problems simultaneously. Integrated farming systems hold a special position because in these systems it can be argued that almost no resources are wasted, and there is continuity of by-products from one system becoming inputs for another.

3.2 Household Empowerment of Smallholder Beef Cattle

Based on Table 3, it can be stated that in aggregate, a household of a smallholder beef cattle farmer has five types of livelihoods, namely: (1) Human Capital, (2) Natural Capital, (3) Physical Capital, (4) Financial Capital, and (5) Social Capital which together form a status of existence on a score continuum of approximately 3,37; that is, in a moderate to high condition. In detail, Table 3 shows that among the 3 constructs make up empowerment of household's beef cattle farmers, one of aspect in household dynamism have the highest average score of 3,675, followed by the livelihood status construct about 3,374, and the last is household resilience beef cattle farmers is 3,180. Scores and categories distribution among beef cattle farmer households in Tambakrejo District follows a similar pattern across the three components that comprise household empowerment. The distribution of scores across the three constructs is modest to high. Approximately 84% of farmer households have medium or high livelihood status. In terms of household resilience, around 70.5% of farmer households fall into the medium to high category. In household dynamism, the distribution of scores is slightly different; approximately 61.5% of farmer households are in the medium to high category, with as many as 87% in the medium to high category and only 13% falling into the low group.

The study found that condition of farming communities in Tambakrejo District, Bojonegoro Regency have strong and in a good state household dynamism and empowerment.

Table 3. Household Empowerment of Smallholder Beef Cattle

Skor	Livelihood Status		Household Resilience		Household Dynamism		Farmer Empowerment	
	ΣRT	%	ΣRT	%	ΣRT	%	ΣRT	%
Very High (5)	12	6	10	5	51	25.5	13	6.5
High (4)	83	41.5	66	33	59	29.5	81	40.5
Medium (3)	85	42.5	75	37.5	64	32	80	40.0
Low (2)	19	9.5	48	24	26	13	25	12.5
Very Low (1)	1	0.5	1	0.5	0	0	1	0.5
Mean Skor	3.374		3.180		3.675		3.410	

4 Conclusion

The study reveals that the empowerment of smallholder beef cattle households achievements cannot be assessed solely through indicators of livelihood status, but must also take into account farmer characteristics, business characteristics, and supportive business environments that enhance their resilience and dynamism. These findings provide valuable insights for policymakers, livestock-extension agents, and development practitioners in designing interventions that go beyond financial or production aspects and instead focus on improving access to credit, market information, training, and institutional frameworks that strengthen to the market linkages. Although this study is limited to a specific region and employs a cross-sectional approach, the insights gained can serve as a foundation for future research across diverse geographical and temporal contexts.

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