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Factors affecting economic profits of stocker cattle farming business in Sakon Nakhon, Thailand

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Abstract

The stocker cattle farming business is an essential component of the cattle production system for farmers in Thailand. Raising stocker cattle independently allows for a reduction in costs related to fattening. This research aimed to investigate the factors influencing the economic profits of farmers in SCFB. The study was carried out in Sakon Nakhon, Thailand. Data were collected via a semi-structured questionnaire through face-to-face interviews with 390 stocker cattle farmers supplying cattle to the Phon Yang Kham Livestock Cooperative Limited in Sakon Nakhon. Data analysis utilized descriptive statistics and binary logistic regression. The results indicated that the majority of the farmers were male, with an average age of 52.78 years and 11.78 years of experience in stocker cattle farming. During an 18-month production period, farmers realized cash profits amounting to 73.43 percent of the total production cost per cattle, whereas the economic profit value was negative. The study identified five factors that significantly impacted the economic profits of SCFB: membership in the association (MA), cattle herd size (CS), feed cost (FC), labor cost (LBC), and selling price (SP). This study provides essential insights into the factors affecting the economic profits of SCFB, which should be considered in policy design aimed at assisting farmers in optimizing stocker cattle farming for profit.

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Introduction

The global food demand has been increasing due to a rapidly growing population (Hoang, 2021), which is one of the biggest challenges in agri-food production. Increasing global beef consumption parallels a surge in global beef production (Office of Agricultural Economics, 2023). The United States is the leading global beef producer and consumer, followed by Brazil and China (United States Department of Agriculture, 2023). In order to cope with the increasing food demand, animal improvement technology has been implemented to increase agricultural productivity related to animals (Dayoub *et al*., 2024), including beef cattle. It brings about a greater growth rate and higher productivity than parents (De Smalen *et al*., 2024).

Beef cattle improvement plays a crucial role in the beef cattle industry across countries. In the United States, selecting traits such as reduced cow weight and increased cumulative weight weaned can improve feed efficiency and reduce methane emissions. Crossbreeding and maintaining genetic diversity through heterotic effectively enhance these traits, contributing to productivity and sustainability (Snelling *et al*., 2022). Effective pasture management and strategic supplementation are crucial for improving productivity in Brazil. It helps maintain optimal animal health and growth rates, reducing the environmental impact per beef unit produced (D'Aurea *et al*., 2021; Lopes *et al*., 2022). In China, the beef cattle industry needs to prioritize production over technological innovation, with targeted training for farm managers to improve efficiency (Xue *et al*., 2024). In Vietnam, the genetic proportion of breeds like Brown Swiss can also be optimized for better productivity outcomes (Bang *et al*., 2022). Beef cattle improvement is important and has been implemented by farmers across countries, including Thailand.

Thailand's government has promoted the adoption of beef cattle farming to develop beef products over the past decade. The government has implemented a project called "The Beef Farm Career Creation Project" from 2016 to 2024, intending to purchase approximately 19,500 stock cows and 97,800 calves from farmers (Office of Agricultural Economics, 2023). Although this program has motivated farmers to produce beef cattle, Thailand experienced a yearly decline with the outbreak of lumpy skin disease. Nevertheless, beef cattle production increased to 1.424 million heads in 2022, marking an 82.48% rise compared to 2021 (Office of agricultural economics, 2022). The growth can be attributed to resolving the epidemic crisis and sustained market demand, leading farmers to expand their beef cow farming operations.

Sakon Nakhon is one of the areas in Thailand with the largest beef cattle population. In 2022, Thailand's beef cattle population reported 289,400 animals, with 5,013 labeled as fattening cattle (Office of agricultural

economics, 2022). Pon Yang Kham Breeding Cooperatives N.S.C. Ltd plays an important role in farmers' beef cattle raising business in Sakon Nakhon. Pon Yang Kham Cooperatives monitor and regulate the production standards for members' cattle raising, breeding procurement, concentrated feed production, slaughtering, and cutting according to international regulations. The Phon Yang Kham's beef cattle breed originates from a crossbreeding program between Thai and French cattle, which involved using semen from three distinct breeds of beef bulls: 1) the Charolais breed, which originated in France and served as the primary breed; 2) the Simmental breed, which originated in Switzerland, and 3) the Limousine breed, which also originated in France (Chantanusornsiri, 2018). Phon Yang Kham beef cattle have been widely popular and renowned among Thai and international consumers. Besides, Phon Yang Kham beef has also been registered as a Geographical Indication (GI) Sakon Nakon's product since 2016, further increasing its value and reputation (Sakon Nakhon Provincial Public Relations Office, 2022).

The beef cattle farming system in Sakon Nakhon comprises three categories: cow/calf production, stocker production, and fattening. However, the stocker cattle for entering the fattening process came from two distinct sources: 1) stocker cattle purchased from Phon Yang Kham Cooperative's members, who raise stock cattle to sell to other members, or using from the farmer's stocker cattle, and 2) stocker cattle purchased from external sources, which is must be met the breed specified by the Phon Yang Kham cooperative, with a 50% European bloodline. Chaosap *et al.* (2019) reported that approximately 77.20% of fattening cattle farmers purchased stocker cattle from external sources. Purchasing stocker cattle for fattening accounted for 73.90% of the total cost of fattening cattle (Sarma *et al.*, 2014). By allowing farmers to raise stocker cattle, the expenses associated with fattening can be minimized (Millen *et al.*, 2011). Stocker cattle refer to cattle that attain approximately two years of age or a weight of 400 kilograms. These cattle are raised from weaned calves, generally around six months old. Cattle in stocker production were permitted to graze and provided with supplemental feed to fulfill nutritional needs. Therefore, stocker cattle production is considered essential to beef cattle farmers.

Although smallholder farmers have adopted beef cattle production, they still face the problem of high production costs. Rapankum *et al.* (2022) reported that beef cattle production cost in Sakon Nakhon was US$ 2054.69 per head per year, and they earned an annual profit of US$ 41.81 per head. However, only cash income contributed to the profit, which did not represent the farmer's actual profit (Hariyanto *et al.*, 2021). Furthermore, the Sakon Nakhon beef cattle farmers traditionally relied on family labor to store rice straw for their livestock, which resulted in high economic costs (Rapankum *et al.*, 2022). Hence, the application of economic profit theory is needed.

Economic profit demonstrates the actual production cost, and examining the opportunity cost of alternative uses for resources within the firm is also never neglected. Economic profit is the difference between total revenue and total costs, with total costs encompassing both explicit and implicit costs (Barnard *et al*., 2020).

In beef cattle farming, production cost is affected by various factors such as production volume, roughage prices, concentrates, labor, and calf prices (Achmad & Mulyo, 2019). Some studies on factors influencing the profitability of beef cattle farming have been conducted in different regions. In Tajikistan, the research by Jobirov *et al*. (2022) claimed that the profitability of beef cattle farming among farmers was significantly affected by factors such as education level, family size, farming experience, pasture availability, land size owned, selling contracts, feed costs, medication expenses, access to credit, and sales costs. In northern Australia, the timing of calving and nutritional management were key to improving reproductive rates, which directly influenced economic returns (McCosker *et al*., 2022). Similarly, higher calving rates in Thailand were associated with better herd management practices (Panbamrungkij *et al*., 2024). Efficient feed management is crucial, as demonstrated by the profitability of fall-calving herds with added hay sales in the U.S., which benefit from strategic herd size management and fertilizer use (Tester *et al*., 2019). Additionally, herd health and genetics, access to veterinary services, and pasture availability are critical, as they directly impact production costs and cattle health (Jobirov *et al*., 2022; Severe & ZoBell, 2011). Socioeconomic factors such as education level, access to credit, and farming experience also play a significant role in profitability, influencing farmers' ability to adapt to challenges like climate change (Jobirov *et al*., 2022; Putri *et al*., 2023). Therefore, the profitability of beef cattle farming is influenced by a multitude of factors, including economic, environmental, and management aspects. However, there is currently no documented study examining the factors that influence the profitability of beef cattle farming across the various systems: cow/calf production, stocker production, and fattening, as indicated by the previous research. Most of the past research has been done on fattening systems. Besides, the profitability of the previous studies was not identified as economic profit and/or accounting profits. Therefore, this paper provides insight into the stocker farming system by addressing these areas.

The two objectives of this research were established: (1) to describe the characteristics of stocker cattle farmers and their farm's profile in the study region and (2) to determine factors that affect the economic profits of the stocker cattle farming business of the stocker cattle farmers. This study seeks to understand better the performance and economic contributions of stocker cattle farming by smallholder farmers in Thailand. Farmers can reduce

risk and use opportunities to improve their financial performance. (Tuovil *et al*., 2024; Chaisombut *et al*., 2022; UT Institute of Agriculture, 2020). It helps policymakers and stakeholders in the agribusiness sector assess their profitability and competitiveness (Achmad & Mulyo, 2019; Jobirov *et al*., 2022). The paper is structured as follows. The next section briefly describes the research methodology. Then, key results and a discussion of the research are presented. The final section is about conclusions and implications.2. Materials and methods

1. Sampling Design and data collection

A sample selection utilized a purposive and snowball randomized sampling technique to determine the sample size of 390 stocker cattle farmers for an unknown population size with a confidence level of 95% and a sample error of 5% based on Cochran (1977) formula. A structured questionnaire was used as a tool for data collection. The two sections of the questionnaire were developed to collect data. The first section contained information about the farmer's demographics, farm profile, and economic cost and return of stocker cattle farming, while the second section consisted of factors affecting the economic profits of stocker cattle farming. The questionnaire was reviewed and tested for content validity by five experts in the field of study and then pre-tested with 30 stocker cattle farmers. The reliability of the interview questionnaire was determined using the formula for calculating the alpha coefficient according to Cronbach's method (Cochran, 1977). The result of finding the confidence value of the questionnaire was 0.88, which is higher than 0.70 (Terwee *et al*., 2007). Improved the interview form and presented it to experts for corrections and improvements until the tool was effective. The researcher has improved and used the complete interview form with the sample group. The farmers who run the business of raising stocker cattle for sale to members of Phon Yang Kham Livestock Cooperative Limited., Sakon Nakhon Province, to continue fattening cattle were targeted as the population of this research. Data were collected over one year through face-to-face interviews with the farmers via a semi-structured questionnaire.

2. Theoretical framework

Economic profit provides a framework for this research. Economic profit depicts the difference between total revenue and total costs, with total costs encompassing both explicit and implicit costs. An explicit cost comprises payments to resource suppliers, such as land, labor, materials, fuel, and

comparable goods. Implicit cost refers to the non-cash expenses associated with production by examining the opportunity costs of alternative uses for resources within the firm (Barnard *et al*., 2020). Economic profit can be written as the formula (Okrenets, 2022):

Economic profit = Total Revenue – (Explicit Costs + Implicit Costs)

Many factors, including economic, environmental, and management aspects, influence the profitability of beef cattle farming. In this research employed predictors as follows;

Education positively influences farmers' income, suggesting that higher education correlates with increased economic profits in beef cattle farming (Asnawi *et al*., 2020; Utami *et al*., 2022).

Household size: large households have more family members available for employment; however, this may result in diminished incomes if the workforce exceeds the optimal threshold (Islam, 2024). Large households incur increased expenses, potentially impacting the profitability of beef cattle farming (Akello & Mwesigwa, 2023).

Off-farm income enhances farmers' capital, enabling investments in animal feed, health, and breeding, potentially increasing production and profits (Anang & Apedo, 2023). Furthermore, off-farm employment among farmers improves income distribution, enhancing financial stability and decreasing reliance solely on beef cattle income (Adam *et al*., 2022).

Experienced farmers demonstrate superior management and decision-making skills, which are crucial for determining optimal selling times for beef cattle and managing associated costs. This factor is crucial for profit generation (Jacinto *et al*., 2022). In Tajikistan, the average age of beef farmers was 52.73 years, and their experience enhanced the profitability of operations, enabling them to leverage their knowledge to maximize returns (Jobirov *et al*., 2022).

Membership in an association enhances profits and efficiency for members compared to non-members, as it provides access to services and support due to proximity to the production site (Dang, 2017). Conversely, members of distant groups may experience reduced profits compared to local farmers, leading to diminished profitability in beef cattle farming (Ali & Flinn, 1989).

The cattle herd size is a critical determinant of farmers' income, as evidenced by Roessali *et al*. (2011), and is statistically significant in enhancing farm profits, according to Mumba *et al*. (2012). Larger herds on farms are associated with increased net profits per head (Boggs & Hamilton, 1997).

Ownership of land enables farmers to modify their land management practices in diverse ways, particularly regarding animal husbandry. This

positively impacts pasture quality and beef cattle health, facilitating weight gain and enhancing returns. This also decreases reliance on the acquisition of animal feed (Adom *et al*., 2024). Furthermore, land ownership diminishes land rental expenses, directly enhancing profits by reducing overall production costs (Wahyuni & Sulistiyowati, 2015).

Ownership of pasture facilitates the effective management of pasture quality, subsequently enhancing profits from cattle fattening (Dos Santos *et al*., 2024). Furthermore, more cattle can be raised within a confined area. This will enhance the economic efficiency of cattle farming (Gianetti & Filho, 2024).

Feed cost - The expense associated with animal feed is a critical determinant of profitability for farmers involved in the beef cattle industry (Muyasaroh *et al*., 2015), as it directly influences the weight gain of cattle (Sumaryanto *et al*., 2024). Cattle farming utilizes a combination of concentrates and roughages in animal feed.

Labor costs significantly influence livestock farming. Effective management of labor costs can lead to increased profits (Otampi *et al*., 2017). Technological advancements influence the management of labor expenses. Compared to conventional beef cattle production systems, this approach necessitates significantly more labor and frequently yields lower profitability (Trukhachev *et al*., 2022).

Transportation costs significantly influence the overall production expenses associated with beef cattle farming. The decision to supplement the diet and implement other operational strategies is influenced, leading to improved financial outcomes (Alonso *et al*., 2019). Selecting an appropriate vehicle can alleviate stress and enhance the health and performance of cattle. This leads to enhanced economic returns (Thomson *et al*., 2015).

The selling price is the primary factor influencing the profitability of the beef cattle business, exhibiting a positive correlation (Langemeier, Mintert, *et al*., 1992). This factor is the primary determinant of profit variation (Mintert *et al*., 1993).

3. Data analysis and model specification

This research employed the binary logistic regression analysis, which was utilized to determine factors affecting the economic profits of the stocker cattle farming business. According to Greene (2003), the binary logistic regression model is derived from the linear probability model;

$$\begin{aligned} Pi &= F(Y) \\ &= F(\alpha + \beta_i X_i) \\ &= 1/(1+e^{-Y}) \end{aligned}$$

where

Pi is the probability of a farmer having economic profits in the stocker cattle farming business, depending on the Xi factor.

E is 2.718 (base for logarithm).

Y is an opportunity for farmers to gain economic profits in the stocker cattle farming business. There are two values: Y = 0 means economic profit in the stocker cattle farming business <= 0, and Y = 1 means the economic profit in the stocker cattle farming business > 0.

The equation can be written as follows:

$$Y = \alpha + \beta_1 ED + \beta_2 HS + \beta_3 OF + \beta_4 PE + \beta_5 MA + \beta_6 CS + \beta_7 LO + \beta_8 PA + \beta_9 FC + \beta_{10} LBC + \beta_{11} LOC + \beta_{12} LOC$$

Table 1 describes the independent variables used to determine the economic profits of farmers in the stocker cattle farming business in Sakon Nakhon, Thailand.

Table 1 - Description of The Variables

Independent Variables	**Description and Measurement**	**Symbol**
Education	Education level (years)	ED
Household size	Number	HS
Off-farm income	1 = Off-farm income 0 = Otherwise	OF
Production experience	Years	PE
Membership in association	1 = Member 0 = Non-member	MA
Cattle herd size	Number of beef cattle	CS
Land owned	Land owned (rai)	LO
Pasture availability	1 = Yes 0 = No	PA
Feed cost	Cost of feed (baht/head)	FC
Labor cost	Cost of labor (baht/head)	LBC
Transportation cost	Cost of transportation (baht/head)	TOC
Selling price	Cattle sale price (baht/head)	SP

4. Results and discussion

4.1. *Respondent's profiles*

Table 2 indicates that the stocker cattle farmers were primarily male (77.95%), with females comprising 22.05%. This finding aligns with the study conducted by Wongnaa *et al*. (2018), indicating the dominance of male farmers in maize cultivation in Ghana. The average age of farmers was 52.78 years. The finding is consistent with the research conducted by Rapankum *et al*. (2022), which revealed that the average age of dairy farmers in Thailand was 49.94 years old. Approximately 73.09% of stocker cattle farmers report having attained an elementary school education level. The farmers had an average household size of 4.28 individuals. The average number of farmers involved in stoker cattle farming per household was 1.41 people. The farmer had an average of 11.78 years of experience in stocker cattle farming. These results are similar to the scenario of a small-scale farmer in Thailand.

Table 2 - Characteristics of the Stocker Cattle Farmers

Characteristics	**Percentage**
Gender	
Male	77.95
Female	22.05
Average ages (year)	52.78
Education	
Primary school	73.09
Secondary school	21.02
Bachelor's degree or higher	5.89
Average family members (people)	4.28
Average family members involved in stocker cattle farming (people)	1.41
Average experience in stocker cattle farming (years)	11.78

Source: own survey computation, 2021

4.2. *Economic costs and returns of the stocker cattle farming business*

Table 3 shows the average economic costs and returns from the 18 months of stocker cattle farming. The findings discovered that the stocker cattle farmers received a net profit of USD447.99 per head, accounting for 73.43 percent of the total production cost. However, the economic profit from stocker cattle showed that farmers lost USD111.73 per head. Farmers spent more money on

variable costs in production, accounting for 97.81 percent of the total cost, and the fixed cost represents 2.19 percent of the total cost. The stocker calve was found to have the highest expense (52.78%), followed by roughage cost (27.44%) and labor cost (12.20%). Fixed costs occupied a small portion of total production costs (2.19%). The return from the stocker cattle farming business was found to have an average total return of USD1,058.05 per head, which consists of income from selling stocker cattle to farmers who are members of the Phon Yang Kham Livestock Cooperative Limited, Sakon Nakhon Province, equal to USD987.40 per head and income from manure USD70.65 per head.

Table 3 - Economic costs and returns of raising cattle for 18 months

Component	Cash (USD/ Head)	(%)	Non Cash (USD/ Head)	Total (USD/ Head)	(%)
1. Total cost	**610.06**	**100.00**	**559.72**	**1,169.78**	**100.00**
1.1 Variable cost	**598.15**	**98.05**	**546.03**	**1,144.18**	**97.81**
Stocker calves	445.75	73.07	171.60	617.35	52.78
Concentrate feed	33.78	5.54	–	33.78	2.89
Roughages	73.30	12.01	247.65	320.95	27.44
Molasses	1.92	0.31	–	1.92	0.16
Mineral supplement	0.41	0.07	–	0.41	0.03
Transportation	6.01	0.99	–	6.01	0.51
Breeding	6.22	1.02	–	6.22	0.53
Labor	26.60	4.36	116.11	142.71	12.20
Electricity, water, and gasoline	4.17	0.68	–	4.17	0.36
Opportunity of variable cost	–	–	10.67	10.67	0.91
1.2 Fixed cost	**11.91**	**1.95**	**13.68**	**25.59**	**2.19**
Interest	11.91	1.95	–	388.17	1.02
Land use	–	–	0.71	23.17	0.06
Property and equipment depreciation	–	–	12.97	422.73	1.11
2. Total income	**1,058.05**			**1,058.05**	
2.1 Selling price	987.40			987.40	
2.2 Manure	70.65			70.65	
3. Net profit	**447.99**	**73.43**		**–111.73**	**–9.55**

* Exchange rate: 32.59 THB/USD on January 3, 2018 (Bank of Thailand, 2024).

Source: Own survey computation, 2018.

The results are consistent with Ruff *et al.* (2016), reporting that stocker cash costs per person include the purchase of stocker calves USD786,983, feeding USD42,625, gathering, trailing, trucking, sorting USD33,944, marketing USD33,560 and other 40,427. According to Peel (2006), it was found that stocker costs of production consisted of a purchase price of 75 to 8 percent, feed and forage cost of 8 to 15 percent, the interest cost of 2 to 3 percent, marketing costs of 2 to 3 percent, veterinary and medical cost 2 to 3 percent, death loss 1 to 3 percent and labor and equipment 1 to 2 percent, respectively. Consistent with Langemeier *et al.* (1992a) the total cost of raising fattening cattle per head was USD888.22, with the highest cost being the feeder cost of USD612.57 followed by the feeding cost of USD251.70. Consistent with Anderson *et al.* (2004), the highest cost was calf USD84.61, followed by forage USD73.88 and hay USD55.00, respectively. This finding is inconsistent with Miller *et al.* (2001). The top three economic costs are feed cost of USD239, family labor cost of USD50.98, and capital charge of USD50.89, respectively. Inconsistent with Jobirov *et al.* (2022) reported that the top 3 costs per cow of fattening cattle were feeds of USD44.51, followed by medicines (treatment), which was USD19.85 and husbandry labor of USD9.95, respectively.

4.3. *Factors affecting the economic profits of the stocker cattle farming business*

Before running the regression, this research employed the Pearson product-moment correlation to test whether there is any multicollinearity issue among the predicting variables. Grove *et al.* (2012) state that the correlation coefficient (r) criteria between two predicting variables of less than 0.65 meet no multicollinearity issues. The correlation test results revealed that the variables used in this research are not highly correlated, as the correlation coefficient is less than 0.65. Therefore, there is no issue of multicollinearity in this research model. The fitness test of the variables in the model is equal to 185.319, which is greater than 15.51 ($\chi^2_{(0.058)}$), at 0.000 significant level, which is less than 0.01. These results indicate that at least one variable in the research model affects the economic profitability of the stocker cattle farming business. Nahelkerke's pseudo-R^2 prediction coefficient was 0.561. The goodness of fit test (Vanichbuncha, 2011) using the Hosmer and Lemeshow method, the value was 7.956, which was less than 15.51 ($\chi^2_{(0.05,8)}$), and the p-value was 0.438. Therefore, it can be concluded that the research model is appropriate.

Binary logistic regression analysis with the enter method was employed to determine factors influencing the stocker cattle farming business. The results

revealed that membership in an association (MA), cattle herd size (CS), feed cost (FC), labor cost (LBC), and selling price (SP) were significantly affecting the economic profit of the stocker cattle farming business ($p < 0.01$) (see Table 4).

Table 4 - Results of the binary logistic regression analysis

Variables	B	SE.	Wald	df	Sig.	Exp(B) Odds Ratio	95% C.I. for EXP(B)	
							Lower	Upper
Constant	–9.984	2.698	13.696	1	0.000	0.000		
ED	0.035	0.056	0.386	1	0.534	1.036	0.927	1.157
HS	0.099	0.120	0.684	1	0.408	1.104	0.873	1.395
OF	0.367	0.607	0.364	1	0.546	1.443	0.439	4.745
PE	0.045	0.025	3.419	1	0.064	1.047	0.997	1.098
MA	–0.880	0.333	6.974	1	0.008***	0.415	0.216	0.797
CS	0.256	0.075	11.517	1	0.001***	1.292	1.114	1.497
LO	–0.024	0.028	0.735	1	0.391	0.976	0.924	1.031
PA	–0.144	0.784	0.034	1	0.854	0.866	0.186	4.023
FC	–0.020	0.003	50.920	1	0.000***	0.980	0.975	0.985
LBC	0.011	0.004	7.650	1	0.006***	1.989	0.982	0.997
TOC	0.048	0.027	3.093	1	0.079	1.049	0.995	1.106
SP	0.015	0.003	34.961	1	0.000***	1.015	1.010	1.020

***, **, * Significant at 0.01 and 0.05 level, respectively.
Note: Chi^2 (12) = 185.319; Prob > chi2 = 0.00 **; Pseudo R^2 = 0.561.
Source: Own survey computation, 2021.

The results of the binary logistic regression analysis for the variables found to be statistically significant, as indicated in Table 4, will next be discussed.

Membership in an association: being a member of an association (MA) has a significant and negative impact on the economic profit of the SCFB ($\beta = –0.880$, $p < 0.01$, Exp(B) = 0.415). The finding suggests that farmers recognized as association members had 0.415 times less chance of making an economic profit from the SCFB than unincorporated or non-member farmers. This outcome aligns with Dang (2017) research, which noted that membership in a farmer's group yielded a negative regression coefficient that was statistically significant at the 0.05 level.Hence, when farmers participate

as group members, their likelihood of achieving higher profits in the stocker cattle farming business diminishes. Joining an economic group may require farmers to allocate time to group activities. Consequently, farmers had reduced the time available to raise stocker cattle.

Cattle herd size: stocker cattle herd size (CS) positively and significantly influences the economic profit of the stocker cattle farming business ($\beta = 0.256$, $p < 0.01$, Exp(B) = 1.292) The finding indicates that stocker cattle farmers with larger stocker cattle herd sizes were 1.292 times more likely to earn economic profit from the stocker cattle farming business. The findings align with Apasedanya *et al*. (2023), demonstrating that herd size in fattening operations significantly influences profitability, as a larger population correlates with enhanced production efficiency and reproductive rates. An analysis of the fattening business indicates profitability, demonstrated by a benefit-cost ratio of 1.9. This finding aligns with Roessali *et al*. (2011), who identified the number of cattle as the primary factor influencing the income of cattle farmers in Central Java province. The findings align with Mumba *et al*. (2012), indicating that the herd size of dairy cows (milk cows) was statistically significant ($p < 0.01$). The profits of small dairy enterprises increased as a result. Consequently, farmers must be incentivized to optimize cattle size to sustain stocker production efficiency.

Feed cost: feed cost (FC) has a significant negative impact on the economic profit of the stocker cattle farming business ($\beta = –0.020$; $p < 0.01$; Exp(B) = 0.980). The results suggest that farmers facing higher feed costs have 0.989 times lower chances of achieving economic profit in the stocker cattle farming business. The findings align with Bandara & Dassanayake (2006), who identified feed price as a significant factor influencing the profitability of small-scale chicken farms, exhibiting a negative coefficient at the 0.01 statistical significance level. The findings align with Lumenta *et al*. (2024), indicating that the feed cost in the beef cattle sector for farmers in North Bolaang Mongondow Regency has a significant impact on the profits of calf farmers ($p < 0.01$). Sumaryanto *et al*. (2024) asserted that animal feed prices significantly positively influence the income of beef cattle business farmers ($p < 0.05$). Similarly, research by Muyasaroh *et al*. (2015) indicates that feed cost significantly affects the profitability of beef cattle, as demonstrated by the analysis of income over feed cost in beef cattle fattening. In Bantul District, the feed cost per unit of weight gain was Rp15,193.47, whereas in Sleman District, it was lower at Rp9,615.67. The higher feed cost in Bantul District contrasts with the income over feed cost in Sleman District, which is Rp10,094.44, compared to Rp9,892.32 in Bantul District. This suggests that effective feed cost management is crucial for enhancing profitability.

Labor cost: labor cost (LBC) determined the economic profit of the stocker cattle farming business positively and significantly ($\beta = 0.011$; $p < 0.01$; Exp(B) = 1.989). The results suggest that farmers with raised labor costs are 1.989 times more likely to achieve economic profit in the stocker cattle farming business. The possible reason is that efficient use of labor results in higher productivity and profits. This finding aligns with Popescu (2014), who identified material and labor costs as critical factors influencing the total cost of milk production, demonstrating a strong positive correlation with income from milk sales. Similarly, research conducted in North Minahasa Regency, Indonesia, revealed that labor wages and feed prices significantly impact the profitability of beef cattle farming, highlighting the necessity of effective labor cost management to sustain profitability (Otampi *et al*., 2017). In addition, a study in North Bolaang Mongondow Regency indicated that labor, feed, and calves significantly influenced the profit margins of cattle farmers, highlighting the importance of efficient labor management for enhancing profitability (Lumenta *et al*., 2024).

Selling price: the selling price (SP) has positively and significantly affected the economic profit of the stocker cattle farming business ($\beta = 0.015$; $p < 0.01$; Exp(B) = 1.015). The results showed that farmers with a higherselling price of stocker cattle had a 1.015 times chance of making more economic profit from the stocker cattle farming business.This finding aligns with the research conducted by Elfadl *et al*. (2015), which examined the association between the profitability of beef farming and the selling price of live animals, revealing that profitability rises as live animal prices increase. Langemeier *et al*. (1992a) reported that the selling price positively correlates with the profit of feedlot steers. In their study, Mintert *et al*. (1993) identified the price of fed cattle as the primary determinant of the profitability of weight-placed steers. Prasetyo *et al*. (2012) asserted that the selling price should be established to guarantee the profitability of the beef cattle farming enterprise. Villanueva (2022) emphasized that the study of the Mexican beef market demonstrates that price transmission from international to domestic markets influences local selling prices, thereby affecting profitability.

Conclusions

The stocker cattle farming business (SCFB) plays a vital role in the cattle production system among farmers in Thailand. Raising stocker cattle independently allows for a reduction in costs related to fattening. Economic profit analysis allows farmers to assess their business's long-term viability, yet research on the factors influencing the economic profit of the SCFB remains limited. Therefore, it is essential to identify the factors that may influence the economic profit of farmers' SCFB.

This study enhances the existing scientific literature by examining factors influencing the economic profit of stocker cattle farming in Thailand. It extends economic profit theory through descriptive statistics and binary logistic regression analysis to identify and assess factors impacting economic profit in the SCFB. The findings indicated that the majority of stocker cattle farmers were male, with an average age of 52.78 years, and had attained education at the primary school level. Farmers had an average of 11.78 years of experience in stocker cattle farming, with at least one family member participating in this activity. The economic analysis of the SCFB revealed negative profits, indicating that small-scale stocker cattle farming should be phased out in the long term. The analysis emphasized that the economic profit of the SCFB among farmers was influenced by factors such as cattle herd size, labor costs, selling prices, association membership, and feed costs. Therefore, these factors could actively lead to variation in economic profit for the SCFB among farmers.

Findings suggested that for the long-run stocker farming business, farmers ought to incorporate additional household agricultural activities to support family income. Furthermore, it is crucial to promote the involvement of a new generation of young farmers in household agricultural activities. Regarding managing the stocker cattle farming business, government institutions ought to provide education to farmers about the benefits of establishing farmer groups and disseminate information concerning the economic scale of the SCFB. Furthermore, it should prioritize reducing feed costs by utilizing local raw materials for animal nutrition. Conduct training sessions to improve productivity in stock cattle farming for farmer associations, enhancing their negotiation skills for better cattle pricing. This approach can potentially increase the incomes of farmers engaged in stocker cattle farming and enhance the long-term stability of their livelihoods. This study theoretically enhances the existing literature on factors affecting the economic profitability of stocker cattle farming among smallholder farmers in Thailand. Future research should concentrate on cow-calf production and fattening systems across the country, as this study is limited to Thailand Acknowledgments.

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