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Self-capacity building of small-scale buffalo farmers in pemalang regency Indonesia

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ABSTRACT. This study aims to determine a model for improving the self-capacity of small-scale buffalo farmers in Pemalang Regency, Indonesia. Primary data was collected from buffalo farmers in Pemalang Regency through a survey. Sub-districts were randomly selected as many as 4 out of 14 sub-districts. Two villages were selected for each sub-district. Each selected village was taken as a census respondent. A total of 226 respondents were obtained. The analysis used in this research is descriptive and Structural Equational Modeling - Partial Least Square (SEM PLS) analysis. The study results show buffalo farmers in Pemalang Regency have low to moderate self-capacity so that the number of livestock owned is relatively fixed yearly to raise livestock as savings and social status. Farmers' self-capacity must be improved by training and counselling through farmer groups. Access to capital and access to information affects farmers' skills in marketing, provision of feed, and handling of livestock reproduction.

Keywords: ability to access capital; ability to access information; buffalo farmers; buffalo reproductive; technical skills.

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Introduction

Pemalang is one of the districts with the highest buffalo population in Central Java Province of Indonesia because climatically (average temperature of 28°C and humidity of 80%, average rainfall of 3,384 mm year^{-1}) is favourable for buffalo farming. The buffalo population in Pemalang Regency fluctuated; in 2019, it recorded as many as 6672 heads and increased in 2020 to 8265 heads. Within this condition, Pemalang Regency was the most buffalo-populated area in Central Java Province. However, the buffalo population in Pemalang Regency has decreased from 8,265 heads in 2020 to 8251 heads in 2021 (Central Bureau of Statistics Central Java Province, 2021). In addition, buffalo cattle biologically have low fertility, late puberty, more extended periods of calving intervals, and silent heat, so the pregnancy rate is low. The decline in buffalo population and performance is partly due to the habits of farmers in raising their animals. Buffaloes are reared extensively and semi-extensively, allowing animals to roam freely and graze in the grasslands (Tadesse & Bahiigwa, 2015; Warriach, McGill, Bush, Wynn, & Chohan, 2015). The traditional Buffalo farmers in Pemalang Regency built the communal cage on the river banks, released their livestock in the morning to graze and wallow in the river, and called up them in the evening to go back to their cage (Muatip et al., 2022). Another study also mentioned another traditional system of Buffalo Farming in Pemalang Regency. Rini and Laksono (2020) mentioned that many farmers grew Buffaloes inside their houses. That traditional farming condition resulted in suboptimal performance and inbreeding that decreased the genetic quality of the animals.

The farmers' roles are essential in maintaining and increasing the buffalo population in Pemalang. Farmers' self-capacity in managing their livestock includes knowledge, attitudes, technical skills, and the ability to overcome various problems needed to achieve better farming, business, a friendly environment, and living (Werkheiser, 2018; Al-Taiy, Al-Salhi, & Al-Mashadani, 2020). To achieve maximum farmers' self-capacity, they should be supported by the level of information availability, the level of learning experience of farmers, and the level of socio-cultural support. Besides the technical skills and ability of buffalo farming, product marketing is necessary for farmers to increase their income from farm sales (Jablonski, Hadrich, Bauman, Sullins, & Thimany, 2022). The indicators of farm product marketing skills essential to the farmers are the capability to access the market, product demand, and marketing channel knowledge (Magesa, Michael, & Ko, 2020).

The purpose of this study was to determine the competencies of buffalo farmers, including marketing skills, feeding skills, livestock reproduction handling, ability to access capital and access to information

Pemalang Regency, as well as modelling efforts to improve the competencies of farmers in buffalo livestock development in Pemalang Regency.

Materials and methods

This study was conducted in Pemalang District, Indonesia, where the respondents were buffalo farmers. Primary data collected were farmer characteristics, including farmer age, farmer education, length of farming, number of holdings, and farmer self-capacity, including marketing skills, feeding skills, livestock reproductive handling, ability to access capital and access to information. The data was obtained from direct and in-depth interviews with buffalo farmers and community leaders, as well as observations of livestock farming. Secondary data was obtained from the Pemalang Regency Agriculture Office and Pemalang Regency BPS.

The research was conducted using a survey method with a random sampling of sub-districts, taking four sub-districts: Belik, Batarbolang, Pemalang, Taman. Each selected sub-district took as many as two villages with a large buffalo population. In the selected villages, the census took respondents, resulting in 226 farmers.

Data on the characteristics of buffalo farmers (age, education, years of farming, number of buffaloes owned) and farmers' capacity (marketing skills, feeding skills, reproductive management, ability to access capital and access to information) were analyzed descriptively based on the mean formula, as follows:

Description: xi = 1st data; n = number of data.

Modelling of farmers' self-capacity development efforts using Structural Equational Modeling - Partial Least Square Analysis (SEM PLS) for Likert scale questions with ratings of strongly disagree (1), disagree (2), agree (3), and strongly agree (4). SEM PLS uses SMART PLS 4.0, as mentioned by Hair Jr, Hult, Ringle, and Sarstedt (2021a). The compiled model is shown in Figure 1.

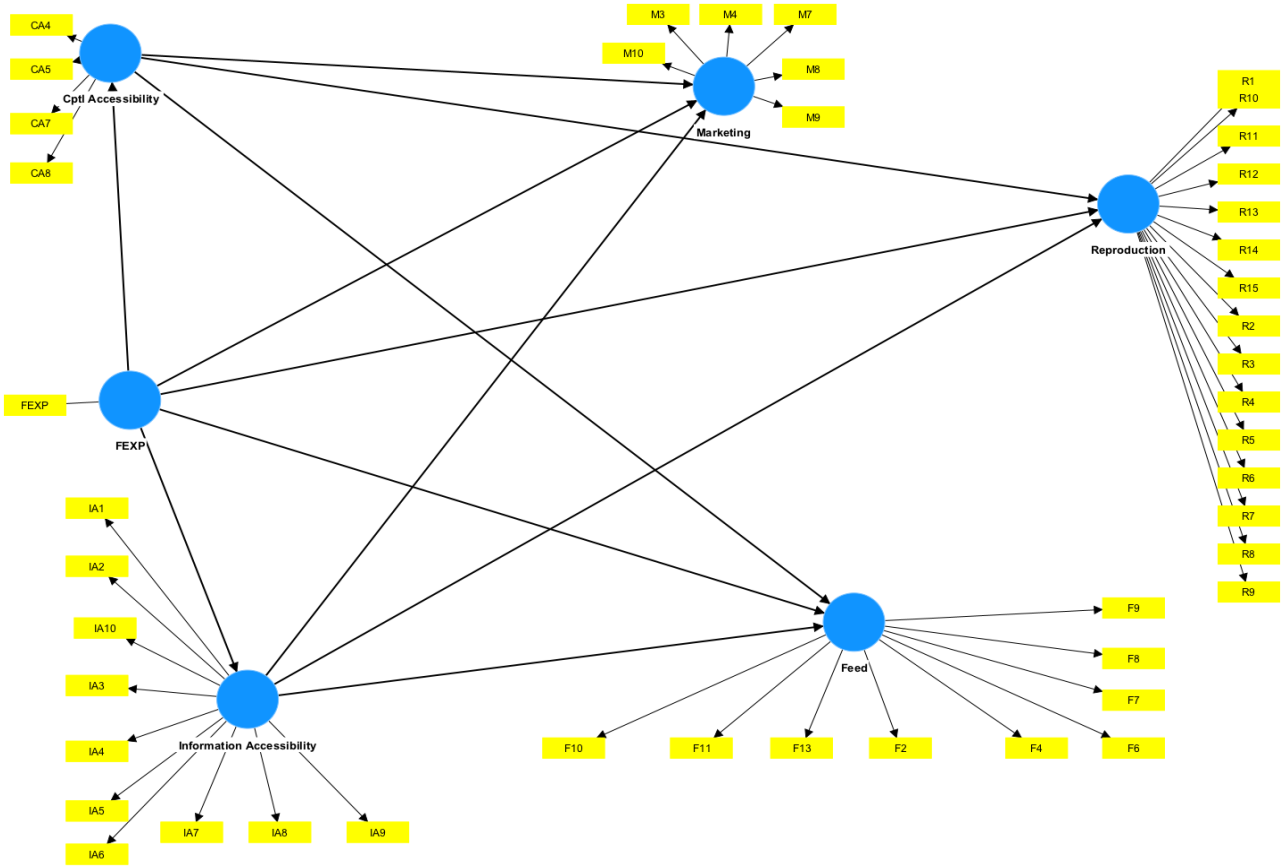

Figure 1. Model structure.

The model obtained is tested for validity and reliability according to Hair Jr, Hollingsworth, Randolph, and Chong (2017), using R-square, reliability and construct validity, discriminant validity, and statistical collinearity. R-square is used to explain the effect of indigenous variables on exogenous variables. This study's reliability and construct validity tests used Cronbach's alpha, composite reliability, and Average variance extract (AVE), which refers to Binsawad (2020). The composite reliability used in this study is rho_a. The

discriminant validity test uses the heterotrait-monotrait ratio test (HTMT). The square root value of AVE in the Fornell-Larcker Criterion test must be greater than the variable correlation. The collinearity statistical test used in this study is the variance inflation factor (VIF) method regarding the Hair Jr, Howard, and Nitzl (2020) report. If the model prepared is fit, the following analysis stage is hypothesis testing using the t-test and PLS Predict.

Results and discussion

Respondent characteristics

Farmer age is the farmer's age when this research was conducted. Age can be categorized into three categories: non-productive, productive, and past productive age. According to Santoso et al. (2023), farmers can be classified as productive age if the farmer is 26 - 65 years old. Farmers at a productive age are more effective in managing their farms than those older. Buffalo farmers in Pemalang Regency range from 16 to 85 years old. 59.73% of buffalo farmers in Pemalang district are of productive age, and 40.27% of farmers are past productive age. Buffalo farmers who are past productive age still keep buffalo cattle because owning buffalo cattle for farmers is a social status and savings.

Table 1 shows that as many as 38.50% of buffalo farmers in Pemalang Regency did not attend school, following research by Pebryna, Muatip, and Djatmiko (2014) that most farmers' backgrounds are elementary school educated. The low level of education affects the work productivity of farmers. Adequate education makes it easier for farmers to accept and apply knowledge and technology in the livestock business to determine a business's success. This condition will impact efforts to increase farmers' capacity (Suyadi, Sumardjo, Uchrowi, & Tjitropranoto, 2019). Economic limitations, the absence of schools around the farmer's residence, and parents' lack of awareness about the importance of education have caused many buffalo farmers never to receive an education. Around 1960-1970, buffalo were used to plow rice fields. Farmers rented out their buffaloes to needy farmers in exchange for a fair amount of money. During the land cultivation season, buffaloes were employed almost daily to plough the fields. The farmer and the farmer's children, who are old enough, control the buffalo when ploughing the fields. Children are the labour force for the family to help their parents earn money, thus neglecting the children's education.

Table 1. Characteristics of buffalo farmers in Pemalang district.

No.	Indicator	Number of farmers (person)	Percentage of Farmer (%)
1.	Age		
	Productive (16 - 55 tahun)	135	59.73
	Past productive (> 55 tahun)	91	40.27
2.	Education		
	Not in school	87	38.50
	Did not graduate from elementary school	9	12.39
	Graduate elementary school	97	42.92
	Graduate from junior high school	11	4.87
	Graduated from senior high school	3	1.32
3.	Farming of duration		
	New (< 20 tahun)	147	65.04
	Long enough (21 - 40 tahun)	70	30.97
	Long (> 40 tahun)	9	3.98
4.	Number of Buffaloes Owned (livestock unit/LU)		
	Few (< 6.25 AU)	180	7.65
	Quite a lot (6.25 - 11.50 AU)	42	18.58
	Many (> 11.50 AU)	4	1.77

Source: Primary data processed (2022).

Farmer education is one of the factors supporting their ability to receive information. The higher the level of education, the broader the perspective and way of thinking in responding to events in the business. The quality of farmers will also increase along with their education in terms of knowledge, attitudes and skills. The need for knowledge about livestock business can foster the motivation of farmers to conduct good livestock business (Balzani & Hanlon, 2020).

Buffalo farmers in Pemalang Regency have 1 - 60 years of farming experience. Between 1 - 20 years is farmers' most typical time (65.04%). The initial ownership of buffaloes came from inheritance, government assistance, maro/'gaduhan' and purchase. Buffalo ownership for farmers is a form of savings and social status,

and not many farmers utilize buffalo rearing as an additional family income. Although farmers have been raising buffaloes for a long time, they still follow their parents' teachings. A long farming period should result in experiences that can support increasing one's capacity (Suyadi et al., 2019).

Buffalo farmers in Pemalang Regency are smallholders. The number of buffaloes farmers own is relatively small, less than 6.25 AU. The small ownership is due to the relatively limited land owned by farmers. Buffalo farmers do not provide land for planting fodder forage. In addition, the purpose of raising buffaloes is to save, so buffalo management lacks focus and professionalism.

Famers' self-capacity

Buffalo farmers in Pemalang Regency live in rural areas far from the city centre. This situation causes farmers to interact with other communities rarely. The low education and cosmopolitan level of farmers are factors that cause farmers to behave in this way. As many as 63.27% of buffalo farmers have grouped and built buffalo pens in groups on riverbanks to make it easier for buffaloes to wallow.

The ability of farmers to market buffalo cattle is in the weak to moderate category. Most farmers sell their animals to intermediary traders who come to their village and only sell to one trader. Buffalo sales are conducted when farmers need large amounts of money. The trader primarily determines the price.

A farmer with an entrepreneurial spirit will view animal husbandry as a business; for instance, a farmer invests to make a profit and ensure the further growth of his animals. The entrepreneurial competencies required by farmers to improve productivity and competitiveness include strategic planning, opportunity (market) identification, relationship building, marketing and value chain development. According to Opolot, Isubikalu, Obaa, and Ebanyat (2018), there are two types of farmers, namely ordinary farmers and farmers as entrepreneurs. Ordinary farmers will be involved in the supply chain with limited diversification, low awareness of market opportunities, and not being part of the network and price takers. In contrast, entrepreneurial farmers will follow a value chain approach, exploiting higher value chains in off-farm and collective markets. Through entrepreneurship training, farmers focused on transforming from ordinary farmers to farmers as entrepreneurs.

Buffalo farmers in Pemalang Regency feed their buffalo with corn stalks, rice straw or other agricultural wastes. If the farmer lacks forage, the farmer orders forage from farmers who have agricultural waste. Sometimes, during the dry season, farmers look for feed outside the city. Buffalo farmers do not provide drinking water in their buffalo pens. The animals will drink at the river and bathe at the same time. Farmers who cultivate their animals intensively (in cages) herd their buffaloes to the river 2-5 times a day.

Buffalo farmers in the Pemalang district have low to moderate feeding skills. Farmers have not calculated feed requirements for each phase of the animal's life, sex or body weight. Therefore, developing skills in feeding is a current priority for developing buffalo livestock (Bush et al., 2014; Ponnusamy et al., 2016).

Research by Saputri, Muatip, and Widiyastuti (2021) in Kebumen Regency found that farmers' skill level in feeding farmers is in the medium category. Farmers do not understand the proper feeding method, whether that feeding needs to be mixed, measured feeding, or feeding that must be differentiated by gender, age, and body weight. They are categorized as the medium category because they provide forage according to the amount of feed obtained on that day; if much forage is obtained, then the forage is given entirely to the livestock. Feeding is not measured or mixed, and the amount of feed given to male or female cattle is the same. Not all farmers have applied feed technology in the form of fermented or ammoniated feed because the forage is still abundant, and farmers can find forage every day. The farmers also have not fed concentrate feed to their livestock.

One of the livestock business's successes is determined by reproduction's success. Proper management of livestock reproduction will result in good production performance, namely an increase in pregnancy rates and the number of births. One of the essential elements in reproduction is mating. There are two buffalo mating systems in Pemalang Regency: natural mating and artificial insemination. However, injected mating is less successful and less desirable for farmers. Silent heat in buffaloes causes less successful detection of heat. Natural mating usually occurs when buffaloes are led to the river to soak or when buffaloes are soaking.

Table 2 indicates that as many as 69.91% of buffalo farmers in Pemalang district have low reproductive skills. Swai, Mollel, and Malima (2014) and Olmo et al. (2021) stated that the knowledge and skills of farmers about livestock reproduction in the low category cause the population and production of ruminants to continue to decline due to decreased production and reproductive capacity of livestock. Extensive rearing

causes uncontrolled mating or inbreeding, degenerating genetic quality. Inbreeding also reduces the ability of the mother to produce optimal weight and number of offspring in one reproductive cycle; it is not uncommon to produce stunted offspring.

Table 2. The marketing, feeding, and reproductive ability of farmers.

No	Indicator	Number of Farmers	Percentage of farmers (%)
1	Marketing ability		
	Low	96	42.48
	Medium	126	55.75
	High	4	1.77
2	Feeding ability		
	Low	101	44.69
	Medium	112	49.56
	High	13	5.75
3	Reproductive ability		
	Low	158	69.91
	Medium	61	26.99
	High	7	3.10
4	Ability to Access Capital		
	Low	70	30.97
	Medium	151	66.81
	High	5	2.21
5	Ability to Access Information		
	Low	94	41.59
	Medium	121	53.54
	High	11	4.87

Source: Primary data processed (2022).

Farmers' capital access capabilities fall into the low to medium category, as most banks and financial institutions in Pemalang are still reluctant to provide loans to farmers because most have unstable incomes, insufficient collateral, high default rates, and poor knowledge of financial matters, similar to the study of Peng, Wang, and Zhou (2022). Efforts can be made to form cooperatives so that rural communities in developing countries can develop because farmers need money to invest in their businesses (Yu, Nilsson, Zhan, & Cheng, 2023). Low financial literacy and limited access to capital also cause farmers to be unable to allocate income and plan family finances (Anane, Zhang, & Nie, 2021).

Fatihudin et al. (2022) stated that farmers' capital sources are partly borrowed from collective traders (individuals) or farmers' capital. The findings of Anane, Zhang, and Nie (2021) indicate that microfinance institutions in rural areas cannot run businesses effectively due to capitalization.

The development of the agricultural sector, coupled with the development of the digital era, has an essential role in improving and fulfilling national needs that provide convenience in accessing and using technology, communication, and information. Farmers' need for information will determine their behaviour.

Buffalo farmers' ability to access information is low to medium level since they have low education and their farm location is far from urban areas. Low education causes farmers not to be able to use their cell phones as a tool to find information related to their business. However, according to the results of research conducted by Tadesse and Bahiigwa (2015) in Ethiopia, the use of cell phones does not significantly affect farmers' market participation. Cell phones play a role in improving farmers' production practices and adopting new practices. The researchers suspected that the insignificant effect could be attributed to the limited use of mobile phones to seek agricultural marketing information. Further research is needed on the role of information communication technology in farmers' market participation and outbound sales decisions. The results can guide policymakers to design appropriate information services to improve farmers' economic conditions and reduce poverty in rural areas (Fan & Garcia, 2018).

Structural equational modelling partial least square (SEM-PLS) results

The first stage in the SEM-PLS analysis is determining the model goodness. The model goodness that consists of discriminant validity, variance inflation factor, outer loadings, construct reliability and validity, and PLS prediction are shown in Tables 3, 4, and 5, respectively.

The Heterotrait-Monotrait Ratio Test (HTMT) aims to assess discriminant validity. The test results above show that the HTMT ratio value is in the range of 0.061-0.504. All of these HTMT values are lower than the

threshold value of 1.00. Ab Hamid, Sami, and Sidek (2017) state that the value of the HTMT ratio, which is close to the threshold value, indicates that the discriminant of the construct variable is invalid.

Table 3. Discriminant validity heterotrait-monotrait ratio (htmt).

Construct	Cptl Accessibility	FEXP	Feed	Information Accessibility	Marketing	Reproduction
Cptl Accessibility						
FEXP	0.061*					
Feed	0.157	0.144*				
Information Accessibility	0.148	0.074	0.384*			
Marketing	0.388	0.082	0.492	0.377*		
Reproduction	0.291	0.125	0.561	0.459	0.504*	

Source: Primary data processed (2022).

Table 4. Variance inflation factors, outerloadings, construct reliability and validity.

Construct	Indicator	VIF	Outer Loading	Cronbach Alpha	Composite reliability (rho_a)	Average variance extracted (AVE)
Capital Accessibility	CA4	3.677	0.835	0.808	0.866	0.631
	CA5	1.259	0.642			
	CA7	4.021	0.853			
	CA8	1.462	0.829			
Feed Technology	F10	1.591	0.712	0.819	0.825	0.406
	F11	1.895	0.681			
	F13	1.339	0.592			
	F2	1.451	0.631			
	F4	1.358	0.510			
	F6	2.382	0.729			
	F7	2.491	0.695			
	F8	2.034	0.572			
	F9	1.490	0.579			
Farmers' Experience	FEXP	1.000	1.000			
Information Accessibility	IA1	2.561	0.706	0.904	0.914	0.540
	IA10	1.576	0.541			
	IA2	2.898	0.705			
	IA3	2.996	0.743			
	IA4	3.052	0.816			
	IA5	2.600	0.806			
	IA6	2.639	0.709			
	IA7	2.264	0.739			
	IA8	3.090	0.793			
	IA9	2.267	0.751			
Marketing Technology	M10	1.497	0.713	0.703	0.719	0.397
	M3	1.452	0.615			
	M4	1.339	0.505			
	M7	1.446	0.626			
	M8	1.458	0.633			
	M9	1.351	0.671			
Reproduction Technology	R1	2.722	0.690	0.932	0.933	0.516
	R10	2.847	0.717			
	R11	2.006	0.691			
	R12	2.929	0.790			
	R13	3.620	0.786			
	R14	3.110	0.758			
	R15	1.874	0.565			
	R2	3.239	0.745			
	R3	3.492	0.779			
	R4	2.793	0.762			
	R5	2.706	0.647			
	R6	3.648	0.756			
	R7	2.348	0.653			
	R8	4.600	0.697			
	R9	4.408	0.698			

Source: Primary data processed (2022).

Table 5. PLS Predict Root Mean-Square error and mean absolute errors.

Indicators	RMSE		MAE		$RMSE_{PLS}$-$RMSE_{LM}$	MAE_{PLS}-MAE_{LM}
	PLS-SEM	LM	PLS-SEM	LM		
CA4	0.386	0.387	0.210	0.210	-0.001	0.000
CA5	0.520	0.518	0.441	0.435	0.002	0.005
CA7	0.391	0.392	0.182	0.182	-0.001	0.000
CA8	0.459	0.459	0.368	0.369	0.000	-0.001
F10	0.642	0.643	0.539	0.541	-0.001	-0.002
F11	0.942	0.943	0.767	0.767	-0.001	0.000
F13	0.454	0.456	0.261	0.262	-0.002	-0.001
F2	1.076	1.078	0.864	0.867	-0.002	-0.003
F4	0.356	0.357	0.201	0.202	-0.001	-0.001
F6	0.999	1.000	0.832	0.831	-0.001	0.001
F7	0.869	0.870	0.737	0.731	-0.001	0.005
F8	1.057	1.056	0.877	0.865	0.000	0.012
F9	0.484	0.485	0.264	0.265	-0.002	-0.001
IA1	0.901	0.901	0.781	0.780	0.000	0.001
IA10	0.834	0.836	0.717	0.719	-0.003	-0.002
IA2	0.843	0.843	0.733	0.734	0.000	-0.001
IA3	0.928	0.930	0.763	0.764	-0.001	-0.001
IA4	0.814	0.814	0.628	0.630	-0.001	-0.002
IA5	0.859	0.860	0.733	0.734	-0.001	-0.001
IA6	0.980	0.981	0.781	0.790	-0.001	-0.008
IA7	0.772	0.772	0.623	0.623	-0.001	-0.001
IA8	0.829	0.829	0.653	0.656	0.000	-0.002
IA9	0.936	0.938	0.805	0.806	-0.002	-0.001
M10	0.879	0.880	0.700	0.701	-0.001	-0.001
M3	0.988	0.991	0.805	0.808	-0.003	-0.003
M4	0.982	0.983	0.839	0.840	-0.001	-0.001
M7	0.902	0.905	0.770	0.772	-0.003	-0.002
M8	1.066	1.068	0.878	0.879	-0.002	-0.001
M9	1.266	1.268	1.126	1.128	-0.002	-0.002
R1	1.094	1.095	0.924	0.926	-0.002	-0.002
R10	0.838	0.840	0.688	0.690	-0.002	-0.003
R11	1.147	1.149	0.983	0.985	-0.002	-0.001
R12	0.920	0.919	0.785	0.786	0.000	-0.001
R13	0.924	0.924	0.767	0.768	0.000	-0.001
R14	1.009	1.009	0.821	0.814	0.000	0.006
R15	1.053	1.057	0.840	0.844	-0.004	-0.004
R2	1.094	1.095	0.913	0.911	-0.001	0.001
R3	1.076	1.076	0.880	0.884	0.000	-0.005

Source: Primary data processed (2022).

The variance inflation factor (VIF) value obtained in this study has the highest value of 4,600. This value is still lower than the maximum threshold submitted by de Vroege, Jong, Videler, and Kop (2022) and Lupoae, Radu, Isai, and Mihai (2023) for the VIF value, which is 5.00. The above results indicate that the construct variables do not have multicollinearity problems. The outer loadings value shows the value of the relationship between construct variables and indicators. The outer loading value obtained in this study is 0.505-0.853. The outer loadings value getting closer to 1.00 indicates a strong relationship between the indicators in the constructed variable. The minimum value of outer loadings for an indicator in a constructed variable is 0.500 (Rustine, Ratnapuri, Karim, & Alamsyah, 2022; Habibi, Mukminin, & Sofyan, 2023). Reliability analysis in this study used Cronbach alpha and composite reliability (rho_a) tests. The overall reliability test value in this study is higher than 0.7, indicating that the indicator questionnaire of the variable is consistent and reliable (Hair Jr et al., 2021b). The validity test in this study also uses the Average Variance Extracted (AVE) test.

The Structural Equational Model provides the direct and indirect effects from the analysis results to understand how each construct affects another directly and indirectly. The results of the direct and indirect impacts of farmers' capital accessibility and information accessibility towards marketing, reproduction, and feed technology skills are provided in Table 6.

Table 6. Direct and indirect effects.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	p values
Direct Effect					
Cptl Accessibility -> Feed	0.027	0.036	0.075	0.363	0.716
Cptl Accessibility -> Marketing	0.283	0.296	0.071	3.987	0.000*
Cptl Accessibility -> Reproduction	0.212	0.219	0.062	3.411	0.001*
FEXP -> Cptl Accessibility	0.049	0.048	0.079	0.617	0.537
FEXP -> Feed	0.106	0.105	0.079	1.341	0.180
FEXP -> Information Accessibility	0.052	0.053	0.068	0.764	0.445
FEXP -> Marketing	0.031	0.034	0.065	0.474	0.635
FEXP -> Reproduction	0.090	0.092	0.070	1.282	0.200
Information Accessibility -> Feed	0.358	0.371	0.055	6.572	0.000*
Information Accessibility -> Marketing	0.286	0.294	0.078	3.687	0.000*
Information Accessibility -> Reproduction	0.402	0.410	0.059	6.793	0.000*
Indirect Effect					
FEXP -> Feed	0.020	0.022	0.027	0.752	0.452
FEXP -> Marketing	0.029	0.027	0.032	0.885	0.376
FEXP -> Reproduction	0.031	0.030	0.035	0.902	0.367

Source: Primary data processed (2022).

Partial Least Square (PLS) Predict tests a model with good predictive ability (Shmueli, Ray, Estrada, & Chatla, 2016). The PLS Predict test can be done by comparing the Root Mean-Square Error and Mean Absolute Errors values in the PLS-SEM and MAE models. The more values of 0.000 and negative in the difference between RSME PLS SEM - RSME LM and MAE PLS SEM - MAE LM indicates that the PLS-SEM model has good predictive ability. This method is known as naïve benchmarks (Shmueli et al., 2019).

Access to capital owned by farmers affects their ability to maintain their business and provide feed for their livestock (Khanal & Omobitan, 2020). Farmers with easy access to capital will be more active in seeking information related to innovations in nutritious feed (Matouš, Todo, & Mojo, 2013; Ali & Erenstein, 2017). During the dry season, farmers who have capital will look for forage outside their village together with their friends in one group (Duguma & Janssens, 2021; Ben-Enukora, Ejem, Aremu, Adeyeye, & Oloruntoba, 2023). Farmers' access to capital could increase their business sustainability (Tey et al., 2014; He & Ahmed, 2022; Wahyono, Hasanah, Parmawati, & Wong, 2023).

Access to capital owned by farmers affects access to marketing. The higher the ability of farmers to access capital, the more excellent the opportunity to increase capital so that farmers have greater bargaining power in determining prices. Easy access to capital results in farmers not rushing to sell their livestock when they need money. Farmers will be better able to plan their livestock production.

Farmers with access to information communication technology are likelier to sell their animals in foreign markets than those without access (Fan & Garcia, 2018). An understanding of the use of communication media and behaviour factors is necessary so that farmers can take advantage of access to information appropriately to increase their self-capacity. Access to information is essential for farmers to make decisions in production, marketing and finance. Information for farmers who want to sell their livestock must find the right price, the right buyer, and the quality standards of their livestock. The source of information is very influential in the innovation adoption process. Sources of information can come from mass media and interpersonal channels such as fellow farmers, traders, extension workers or other information.

Conclusion

Buffalo farmers have low-medium self-capacity, so the number of livestock owned is relatively fixed yearly. Farmers' capacity needs to be improved by training and counselling through farmer groups. Access to capital and information affects farmers' marketing skills, feed provision, and livestock reproduction. Extension workers need to encourage farmers to increase the use of mobile phones in finding information about innovations and access to capital and marketing so that livestock businesses can develop and increase farmers' welfare increases.

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