

Entrepreneurial Behaviour of Upland Program Recipient Livestock Farmers in The Central Java Province, Indonesia, Based on Modified Planned Behaviour Theory

Danang Nur Cahyo^{1,†}, Krismiwati Muatip¹, Mochamad Sugiarto¹, Yusmi Nur Wakhidati¹, Tri Rachmanto Prihambodo¹, Lis Safitri¹, Indra Sugiharto¹ and Akhlis Rahman Sari Nurhidayat²

¹Faculty of Animal Science, Universitas Jenderal Soedirman, Purwokerto 53122, Indonesia.

²Faculty of Engineering, Universitas Jenderal Soedirman, Purbalingga 53371, Indonesia.

[†]Corresponding Author

ABSTRACT

Traditional farmers need to improve their capabilities and adopt entrepreneurial behaviour to enhance the productivity and competitiveness of livestock businesses. This study aims to analyse the entrepreneurial behaviour of farmers participating in the Upland Program in Central Java using the Theory of Planned Behaviour (TPB), and to identify the key factors influencing this behaviour. As an added novelty, this research applies a modified TPB framework to evaluate entrepreneurial behaviour among livestock farmers within a government-supported rural development program—an approach that has rarely been explored in the Indonesian context. The study was conducted in two purposively selected regencies, Purbalingga and Banjarnegara, which represent local livestock development centres and are recipients of the Upland Program. The minimum sample size was determined using the G*Power software, and 166 farmers were interviewed with a structured questionnaire. Data were analysed descriptively and statistically using the Partial Least Squares Structural Equation Model (PLS-SEM) approach. The findings indicate that farmers' characteristics, attitude, perceived behavioural control, and intention fall into the medium category, while subjective norms and entrepreneurial behaviour fall into the medium-high category. Attitude and perceived behavioural control significantly affect both intention and entrepreneurial behaviour, whereas subjective norms do not show a significant influence. Differences in location also result in variations in farmers' intentions and entrepreneurial behaviour. These results highlight the importance of strengthening farmers' attitudes and perceived behavioural control, particularly through intensive assistance and capacity-building initiatives. Enhancing these factors is expected to encourage stronger entrepreneurial behaviour among livestock farmers, ultimately contributing to improved productivity and overall welfare.

KEYWORDS

Central Java Highland; Entrepreneurial Behaviour; Theory of Planned Behaviour; PLS-SEM

CORRESPONDING AUTHOR

Danang Nur Cahyo
danang.nur.cahyo@unsoed.ac.id

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1. Introduction

Indonesia has a long-standing agricultural culture, supported by high environmental conditions and biodiversity. A series of these activities also includes livestock farming activities passed down from generation to generation. Given this long history, it is unfortunate that Indonesia has been unable to meet its domestic beef needs and must import beef. Beef imports will continue to increase by 3.28%/year until 2027 (Cahyo and Purwaningsih, 2022). The strategy to reduce the import projection is to substitute beef with other red meat. Red meat produced by goats and sheep is one of the products that can be used to replace and reduce beef imports.

This statement is supported by global production and demand trends, which show an increase in the small ruminant population and meat demand in recent years (Mazinani and Rude, 2020). In line with the previous statement, Central Java Province, Indonesia's highland areas, have a high biodiversity of small ruminant livestock, such as goats and sheep. Hariyono and Endrawati (2023) stated that Central Java Province has high goat livestock biodiversity, including Kacang, Bligon/Jawarandu, Etawa Cross, and Kejobong goat breeds. In addition to goats, this Province also has a sheep biodiversity, including Javanese thin-tailed sheep, Batur, and Wonosobo (Ibrahim et al., 2023). The wealth of natural resources in Central Java Province is well utilised for farming families' livelihoods, but their use is not optimal.

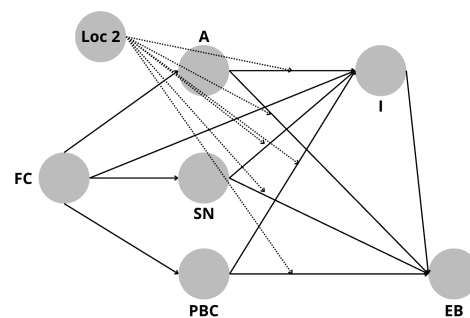


Figure 1. Research Model of Modified Theory of Planned Behaviour on Farmers' Entrepreneurial Behaviour

The use is not optimal due to a problem: most farmers still use traditional maintenance systems (Agus and Widi, 2018).

Traditional livestock activities have a disadvantage, namely, the low entrepreneurial behaviour of farmers. Traditional farmers who lack entrepreneurial behaviour find it challenging to develop their businesses because they have an underdeveloped mindset, are afraid to take risks, lack innovation, and are pessimistic (Barzola Iza et al., 2019). To overcome these problems, the government of Central Java Province held training sessions to increase farmers' capacity. Activities funded by the UPLAND Project are ongoing until the end of 2023 (Widayanti et al., 2024) and are expected to improve entrepreneurial behaviour. The UPLAND Project is an integrated agricultural development program in Indonesia aimed at improving productivity, income, and sustainability in upland farming communities through infrastructure support, capacity building, and value-chain strengthening. Farmers with entrepreneurial behaviour are willing to change and adopt techniques and innovations that can foster the growth of their businesses (Khoshmaram et al., 2020). Research on farmer behaviour is generally conducted using the theory of planned behaviour (TPB). The main principle of this theory is that farmers' attitudes, subjective norms, and perceived behavioural control will influence entrepreneurial intentions. Then, these entrepreneurial intentions will result in an individual's entrepreneurial behaviour (Ajzen, 2020; Lihua, 2022).

Previous research has used the TPB theory to predict factors that affect farmers' behaviour and entrepreneurship. Senger et al. (2017) analysed the intention of smallholders to adopt diversification of agricultural production. Che Nawi et al. (2022) reported using TPB theory to measure the influence of attitudes, subjective norms, and perceived behavioural control on intentions, knowledge, and acceptance of agro-entrepreneurial behaviour. Sok et al. (2021) explain that individual characteristic variables can be included as one of the constructs in the TPB theory because they are likely to affect intentions and behaviours indirectly. Imelda et al. (2022) stated that individual character is strongly correlated with the entrepreneurial character of farmers. However, previous studies still have several specific limitations: they did not explicitly integrate individual or breeder characteristics into the TPB structural model, did not examine entrepreneurial behaviour within highland farming systems recently supported by government interventions such as the UPLAND Program, and rarely focused on small ruminant farmers integrated with plantation systems or located in regions with unique local livestock breeds. This research will cover the gap from previous studies, including the TPB theory in this study will

be modified by adding the construct of breeder characteristics to suspect attitudes, subjective norms, and perceived behavioural control, the research will be carried out in highland areas that have just completed the UPLAND Program from the government by targeting small ruminant farmers who are integrated with plantations, as well as research locations that have uniqueness because it has a local livestock breed. This novelty will make this research unique compared to previous studies.

This research aims to develop a strategy to improve the capacity and quality of small-ruminant farming businesses. It is included in the roadmap for local livestock development research in Central Java Province. This research aimed to understand small ruminant farmers' entrepreneurial behaviour and the factors that affect it. After this research is completed and the data is obtained, a conclusion can be made in the form of a strategy to improve the entrepreneurial behaviour of small ruminant farmers in Central Java Province. This entrepreneurial behaviour is expected to enhance business quality and impact livestock farmers' welfare.

2. Materials and Methods

The cross-sectional survey method was used to capture small ruminant farmers' entrepreneurial behaviour after the implementation of the Upland Project's programs in Central Java Province. The research was conducted from September to November 2024. The research locations were chosen purposively in two of the three Regencies that received the Upland Project. Namely, the Purbalingga and Banjarnegara Regencies were chosen as the research areas because they are breeding centers for local livestock breeds. The local breeds were Kejobong Goat from Purbalingga and Batur Sheep from Banjarnegara. Two districts were purposively selected from each regency: Kejobong and Pengadegan Districts in Purbalingga Regency, and Pejawaran and Batur Districts in Banjarnegara Regency.

The minimum number of respondents was determined using the G*Power software (Kang, 2021) with input parameters Effect size $f^2 = 0.25$, alpha error probability = 0.05, power = 0.90, and number of predictors = 36. Based on the calculation using the specified input parameter values, 158 respondents were required to meet the research model requirement. One hundred farmers from Purbalingga Regency and sixty-six farmers from Banjarnegara Regency were included as respondents of this research due to their membership and activity in farmers' organisations. This research observed both primary and secondary data. Primary data, including farmers' profiles, entrepreneurial behaviour, and factors expected to influence behaviour based on the Theory of Planned Behaviour (TPB), were obtained

Table 1. Research construct, coding, and indicators

Construct	Code	Definition / Indicator
Location	Loc2	1: Purbalingga Regency; 2: Banjarnegara Regency
Farmers' characteristics (FC)	FC1	Farmers education (Elementary: 1; Junior high: 2; Senior high: 3; Higher education: 4)
	FC2	Farming experience (<5 years: 1; 5–10: 2; 10–15: 3; >15: 4)
	FC3	Livestock population (<3 heads: 1; 4–7: 2; 8–11: 3; >12: 4)
	FC4	Good farm productivity
	FC5	Strong motivation in running livestock business
	FC6	Passion for farm business development
	FC7	My business is profitable
	FC8	Strong commitment to business development
Attitude (A)	A1	I feel familiar with entrepreneurial behaviour
	A2	I find entrepreneurial behaviour interesting
	A3	I have a positive perception of entrepreneurial behaviour
	A4	I enjoy applying entrepreneurial behaviour
	A5	I find entrepreneurial behaviour beneficial for my farm
	A6	I believe entrepreneurial behaviour can improve farm productivity
	A7	I believe entrepreneurial behaviour can enhance my well-being
Subjective norms (SN)	SN1	I believe my family supports my entrepreneurial behaviour
	SN2	I believe my closest neighbours support entrepreneurial behaviour
	SN3	I believe my group members support entrepreneurial behaviour
	SN4	I believe community leaders support entrepreneurial behaviour
	SN5	I believe entrepreneurial behaviour is not against norms
	SN6	The local government encourages entrepreneurial behaviour
	SN7	I believe successful farmers apply entrepreneurial behaviour
Perceived behavioural control (PBC)	PBC1	I am capable of taking beneficial risks for my farm
	PBC2	I am capable of learning and applying innovations
	PBC3	I am capable of planning my business for the future
	PBC4	I am capable of being independent in managing my farm
	PBC5	I find it easy to attend entrepreneurship training
	PBC6	I feel capable of applying entrepreneurial behaviour if I want to
	PBC7	I believe entrepreneurial behaviour is easy to apply
	PBC8	I believe applying entrepreneurial behaviour will increase chances of success
Intention (I)	I1	I am highly determined to apply entrepreneurial behaviour
	I2	I plan to apply entrepreneurial behaviour in the near future
	I3	I intend to participate in entrepreneurship training
	I4	I am preparing myself to apply entrepreneurial behaviour
	I5	I plan to study farming innovations
	I6	I will prepare a business plan for my livestock business
	I7	I will attend technical training to improve my skills
	I8	I recommend entrepreneurial behaviour to colleagues
Entrepreneurial behavior (EB)	EB1	I have applied technology in my farm
	EB2	Willingness to take risks to improve business
	EB3	Diligent
	EB4	Applying livestock farming innovation
	EB5	Responsive to development opportunities
	EB6	Independent
	EB7	Future-oriented business development planning
	EB8	Task- and result-oriented livestock business management
	EB9	Good knowledge and skills in livestock farming
	EB10	High self-confidence

through structured questionnaires administered during in-depth interviews with respondents. In contrast, secondary data were obtained through Purbalingga and Banjarnegara Regency Agriculture Service documents. The model used for this study is presented in **Figure 1** that illustrates the conceptual model used in this study, which is a modified version of the Theory of Planned Behaviour (TPB), where farmers' characteristics (FC) are included as an exogenous construct influencing Attitude

(A), Subjective Norms (SN), and Perceived Behavioural Control (PBC), based on previous evidence that individual attributes can indirectly shape behavioural intentions and actions; the model also incorporates district location (Loc) as a moderating variable to capture behavioural differences across research sites. The core TPB structure is maintained, with A, SN, and PBC hypothesized to influence farmers' Intention (I) to perform entrepreneurial behaviour, which subsequently affects

Table 2. Farmer’s characteristics

Characteristics	Purbalingga Regency (n=100)		Banjarnegara Regency (n=65)	
	Average	SD	Average	SD
Age (years)	51.27	11.27	40.36	11.59
Education (years)	7.85	3.12	8.41	2.59
Farmers’ Experience (years)	8.53	8.47	9.88	8.17
Sex	N	%	N	%
Male	95	95	64	96.98
Female	5	5	2	3.03
Main Occupation	N	%	N	%
Crop Farmer	47	47	29	43.93
Laborer	17	17	1	1.52
Trader	20	20	2	3.03
Business Owner	7	7	3	4.55
Livestock Farmer	0	0	27	40.91
Other	9	9	4	6.06

Entrepreneurial Behaviour (EB), while direct paths from A, SN, and PBC to EB are added to assess their immediate behavioural effects. Farmers’ characteristics (FC) are modelled to influence not only A, SN, and PBC, but also I and EB directly, allowing both mediated and unmediated pathways to be examined. The moderating role of Loc, represented by dotted lines, suggests that the relationships among TPB variables may vary across districts, making this comprehensive framework suitable for evaluating behavioural determinants among highland small-ruminant farmers participating in the UPLAND Program.

The entrepreneurial behaviour of farmers in this study was examined in relation to the SDGs to determine the influence of intention (I), attitude (A), subjective norms (SN), and perceived behavioural control (PBC) on entrepreneurial behaviour (EB). The farmers’ characteristics variable was added to the TPB model to examine its effects on intention, attitude, subjective norms, and perceived behavioural control. The two locations in this study were also used as moderation variables to see the impact of location differences on intention and entrepreneurial behaviour. The variable/construct used in the research is mentioned in **Table 1**.

The profile data of the farmers, consisting of name, age, education (years), experience (years), sex, and occupation, were analysed descriptively (Burton, 2014) to explain the characteristics of Kejobong Goat farmers in Purbalingga Regency, Central Java. Entrepreneurial behaviour data were analysed descriptively and statistically using Partial Least Squares Structural Equation Modelling (PLS-SEM) based on the method of Hair et al. (2021). PLS-SEM is a method for determining the relationships among constructs in a model. PLS-SEM analysis can also explain how these variables have a direct or indirect effect. Each indicator of the construct was analysed descriptively, but only variables with certain outer loadings will be included in the model.

The tests conducted in this study include the coefficient of determination test (R2 and Adjusted R2), statistical collinearity, reliability, and validity. The test for statistical collinearity is the variance inflation factor (VIF), with a limit of <5. The outer loading value is used as a convergent validity test, with a minimum threshold of 60%. The reliability test in this study uses Cronbach’s alpha and composite reliability, with a threshold

of at least 0.6. The validity test used in this study uses the average variance extracted (AVE) value with a minimum value of 0.5 and Heterotrait Monotrait Ratio (HTMT) with a maximum value of 0.9 (Ab Hamid et al., 2017; Hair et al., 2019; Lin et al., 2016; Purba et al., 2021). The next stage of testing is the model hypothesis test, which determines the direct and indirect effects of the variables. A total of 36 hypotheses will be tested in this study, comprising endogenous, exogenous, mediation, and moderation constructs.

3. Results and Discussion

3.1. Farmers profile

Small-ruminant farmers in the Purbalingga and Banjarnegara Regions exhibit diverse characteristics. In this study, the characteristics of the farmers were age, education, gender, and main occupation. The characteristics of Kejobong goat farmers are presented in **Table 2**. The average age of respondents in Purbalingga is about 10 years older than in Banjarnegara. The average age of farmers in Purbalingga is about 11 years older than in Banjarnegara; nevertheless, the average age in both locations was categorised as productive. Tauer (2019) stated that the productivity of agrocomplex businesses can be maintained by farmers until age 65, after which productivity will decrease. The rural ageing population poses challenges for agricultural production systems, as advancing age affects health and productivity (Li et al., 2023).

The average education level of respondents in Purbalingga was 7.85 years, while in Banjarnegara it was slightly higher, 8.41 years. The average education level of small ruminant farmers in Purbalingga and Banjarnegara is grades 1 to 2 in junior high school. This average is low considering the minimum education standard from the government is 12 years, namely through the 12-year compulsory education program (Sukmayadi and Yahya, 2020). These results showed a better education level of the farmers, as Sujianto et al. (2022) reported that the rural farmers’ education was at the elementary school level. Yang et al. (2022) stated that the background of farmers’ education is related to entrepreneurial behaviour because, through education, a person will gain better knowledge, problem-solving skills, and knowledge-taking behaviour. Non-formal education is the solution to the current educational conditions of farmers in

Table 3. Theory of planned behaviour construct descriptive analysis

Variables	Category						N Total	% Total
	Low		Medium		High			
	N	%	N	%	N	%		
Purbalingga Regency								
Farmers' Characteristic	1	1	90	90	9	9	100	100
Attitude	3	3	58	58	39	39	100	100
Subjective Norm	0	0	52	52	48	48	100	100
Perceived Behavioural Control	0	0	66	66	24	24	100	100
Intention	2	2	65	65	33	33	100	100
Entrepreneurial Behaviour	1	1	54	54	45	45	100	100
Banjarnegara Regency								
Farmers' Characteristic	0	0	53	80.30	13	19.70	66	100
Attitude	0	0	35	53.03	31	46.97	66	100
Subjective Norm	0	0	31	46.97	35	53.03	66	100
Perceived Behavioural Control	0	0	38	57.57	28	42.43	66	100
Intention	0	0	38	57.57	28	42.43	66	100
Entrepreneurial Behaviour	0	0	33	50	33	50	66	100

Indonesia (Mariyono et al., 2021). In line with this, implementing the UPLAND Project Indonesia aims to provide farmers with comprehensive knowledge about integrated agriculture.

Farming experience showed that respondents in Banjarnegara had longer farming experience (9.88 years) than Purbalingga (8.53 years). Farmers' experience in Banjarnegara is 0.56 years longer than in Purbalingga. The difference from the average is slight, and only six months apart. Experience is an essential resource for farmers in managing livestock, addressing animal health problems, and navigating production and market cycles. With adequate experience, farmers can develop better skills and knowledge, boosting productivity and overall welfare (Sugiarto et al., 2025b,a). Farmers with more farming experience and duration have received more training and informal education that would impact their knowledge, skill, and behaviour (Kangogo et al., 2024).

Most respondents in both regencies were male, namely 95% in Purbalingga and 96.96% in Banjarnegara. Based on main occupation, the majority of respondents in Purbalingga are food crop farmers (47%), whereas in Banjarnegara, a significant proportion are crop farmers (43.93%), followed by livestock farmers (40.91%). Other professions include labourers, merchants, business owners, and other occupations with varying proportions in the two regencies. The results show that men dominated the farming occupation, as reported in numerous previous studies across various farming production systems (Guntoro et al., 2024; Lianou and Fthenakis, 2021; Widyastuti et al., 2023). The dominance of men in agriculture is driven by historical, physical, and sociodynamic factors (Dharamshi et al., 2023; Tarjem and Tufan, 2023; Voss et al., 2024).

The farmers in Banjarnegara regency have a higher percentage of respondents who run their small-ruminant farms as their primary occupation. Small ruminant production is allegedly a primary job if the farmers spend about 40 hours each week running this business (Munoz et al., 2019). The farmers mainly run the traditional livestock production system in the rural area of Java island as a secondary job, while their primary job is crop agriculture farming (Winarto et al., 2000). The previous study also

mentioned that the primary goal of livestock raising is for "saving" (Budisatria et al., 2007; Widi et al., 2015). Due to these conditions, Farmers have not prioritised their livestock businesses in terms of time, energy, and resource allocation; therefore, the development of respondents' livestock businesses is very slow and can even lead to a decrease in business scale. The livestock business, which has not been the main priority, is challenging to apply entrepreneurial principles, specifically in the livestock business. Another strategy that can be used in applying entrepreneurial principles is to apply the principle of agricultural-livestock integration so that entrepreneurial principles can positively impact the family business of farmers (Sekaran et al., 2021; Wulandari and Villano, 2021).

3.2. Farmers' characteristics and theory of planned behaviour descriptive analysis

Farmers' Characteristics (FC) (Table 3) in Purbalingga and Banjarnegara Regencies are in the medium category, with percentages of 90% and 80.30%, respectively. Table 3 shows that the farmers in both areas possess a medium level of farmer characteristics, indicating a good education level, farming experience, animal population, productivity, motivation, passion, profitable business, and commitment to their business. The level of education, experience of farmers, and the scale of the business affect the knowledge, skills, business strategies, decision-making an behaviour of farmers (Lianou and Fthenakis, 2021; Mumba et al., 2024), one of which can increase access for small-scale farmers to high-value markets which can have a significant impact on the economic productivity of livestock (Tyrone et al., 2024). Motivation and commitment to running a livestock business are closely related and play essential roles in developing such businesses (Muatip et al., 2022). Developing a good livestock business will lead to an entrepreneurial behaviour and profit-oriented business (Thakur et al., 2025; Yang et al., 2022).

Farmers' attitude (A) towards entrepreneurial behaviour in both Regencies is in the medium category, but farmers in Banjarnegara have a higher level than those in Purbalingga. Attitude in the theory of planned behaviour (TPB) is a predictor variable of intention resulting from an individual's evaluation

Table 4. Value of Outer Loading, VIF, Cronbach Alpha, Composite Reliability (rho_c), AVE, and Q²

Construct	Indicator	Outer Loading	VIF	Cronbach Alpha	Composite Reliability (rho_c)	AVE	Q ²
Farmers' Characteristics	FC4	0.617	1.242	0.747	0.832	0.501	
	FC5	0.670	1.326				
	FC6	0.768	1.746				
	FC7	0.656	1.434				
	FC8	0.808	1.775				
Attitude	A1	0.673	1.520	0.834	0.875	0.500	0.072
	A2	0.733	1.682				0.123
	A3	0.658	1.401				0.164
	A4	0.682	1.564				0.099
	A5	0.707	1.639				0.140
	A6	0.752	1.691				0.263
	A7	0.741	1.686				0.258
Subjective Norm	SN1	0.749	1.445	0.751	0.834	0.501	0.256
	SN2	0.695	1.369				0.190
	SN3	0.735	1.512				0.133
	SN5	0.676	1.371				0.175
	SN6	0.680	1.349				0.128
	PBC1	0.713	1.222				0.674
PBC3	0.767	1.454	0.128				
PBC4	0.663	1.255	0.178				
PBC8	0.698	1.305	0.135				
Intention	I3	0.729	1.656	0.848	0.888	0.506	0.124
	I4	0.747	1.635				0.203
	I5	0.761	1.725				0.279
	I6	0.767	1.736				0.229
	I7	0.810	2.154				0.215
	I8	0.709	1.556				0.143
Entrepreneurial Behaviour	EB1	0.731	1.665	0.843	0.881	0.515	0.105
	EB4	0.666	1.605				0.079
	EB5	0.748	1.798				0.131
	EB7	0.722	1.531				0.251
	EB8	0.668	1.446				0.199
	EB9	0.755	1.905				0.159
	EB10	0.728	1.710				0.157

of specific behaviour (Phung and Dao, 2024; Spina et al., 2024). Attitude is also a variable in other theories, namely the Technology Acceptance Model (TAM), which is a predictor of intention. This theory explains that attitudes are influenced by a person's perception of the benefits and usefulness of technology (Mishra et al., 2024; Wang et al., 2019). The better the farmers' attitude towards a behaviour, the more likely they are to start implementing it, which in this study is entrepreneurial behaviour. In line with this, agricultural extension programs aimed at improving knowledge, skills, and attitudes (Al-Ansari and Hasan, 2021; Okunade, 2007) should not only focus on technical matters but also on improving entrepreneurial behaviour.

Subjective norms (SN) in Banjarnegara Regency are better, as they fall into the high category, whereas in Purbalingga they are in the medium category. The subjective norm construct in Banjarnegara is higher than in Purbalingga. These results are likely due to the geographical differences between Banjarnegara and Purbalingga regencies. The farmers in the Banjarnegara upland area are more isolated than those in Purbalingga, resulting in a higher SN value among Banjarnegara farmers. Social norms

reflect the local community's perspective on specific behaviour, as reflected in a person's perception; thus, it's normal if there is a difference between social norms in Purbalingga and Banjarnegara Regency. Voigt (2024) stated that the community's SN could be determined by the geographical conditions, family, institutions, culture, tradition, and environmental adaptation.

Perceived behavioural control (PBC) among farmers in Purbalingga and Banjarnegara is in the medium category (66% and 57.57%, respectively). The medium category of farmers' PBC means farmers feel entrepreneurial behaviour is neither easy nor difficult to adopt. Behaviours are considered easy to do and have higher PBC values, which can increase individual intentions to adopt the behaviour (Hwu and Yu, 2006). Practical support in the form of access to resources and infrastructure development can eliminate perceived barriers and increase PBC values (Paudyal and Kaniyamattam, 2024; Wu et al., 2024). Muatip et al. (2024) added that access to information improves farmers' perceived behaviour and increases the adoption of better feed, reproduction, and marketing management.

Farmers' intention (I) to adopt entrepreneurial behaviour

Table 5. Heterotrait Monotrait (HTMT) Ratio

	A	EB	FC	I	Loc2	PBC	SN	Loc2×PBC	Loc2×SN	Loc2×A
A										
EB	0.892									
FC	0.745	0.727								
I	0.875	0.881	0.742							
Loc2	0.163	0.168	0.114	0.245						
PBC	0.768	0.811	0.786	0.898	0.138					
SN	0.704	0.769	0.814	0.740	0.137	0.798				
Loc2×PBC	0.346	0.303	0.243	0.364	0.097	0.760	0.305			
Loc2×SN	0.176	0.267	0.369	0.237	0.116	0.336	0.688	0.436		
Loc2×A	0.584	0.462	0.324	0.523	0.141	0.457	0.217	0.599	0.301	

Table 6. R-squared and R-squared adjusted

	R-square	R-square adjusted
A	0.359	0.355
SN	0.391	0.387
PBC	0.314	0.310
I	0.713	0.699
EB	0.688	0.673

in both areas was in the Medium category. The farmer entrepreneurial behaviour (EB) in Purbalingga Regency is in the medium category, while in Banjarnegara Regency it is in the medium-high category. Intention is the strongest cognitive component in predicting behaviour. Therefore, it is important to know the supporting factors of intention to influence human behaviour (Ajzen, 2018). There are differences in categories between the level of intention and behaviour of farmers in Purbalingga and Banjarnegara. The intention and behaviour of farmers in Purbalingga Regency are at the same level, whereas in Banjarnegara, behaviour exceeds intention. This condition is thought to be due to the influence of subjective norms. Subjective norms in Banjarnegara are at the same level as entrepreneurial behaviour, which is in the high category (Table 3). The difference between intention and behaviour is likely due to an intention-behaviour gap. The intention-behaviour gap is a condition where there is a difference between intention and behaviour (Conner and Norman, 2022). Meta-analytic research shows a strong correlation and influence between intention and/or behaviour; PBC can also directly affect behaviour without affecting intention (Schwenk and Möser, 2009).

3.3. PLS-SEM Analysis

Table 4 presents the results of the analysis of outer loading, multicollinearity (VIF), composite reliability (Cronbach’s alpha and rho_c), convergent validity (AVE), and PLS prediction (Q2). The test threshold is specified in the Materials and Methods chapter. The outer loading value of the selected indicators in this study ranged from 0.617 to 0.810. This value is already above the threshold value set for this study. The research model did not exhibit multicollinearity (VIF <5.000). The research model was classified as reliable based on Cronbach’s alpha and rho_c values (>0,600). The results showed that the model had predictive relevance, as evidenced by the positive Q2 values.

The following model suitability analysis was a discriminant

validity test with the HTMT ratio and determination coefficient presented in Table 5 and Table 6, respectively. The research model demonstrated discriminant validity based on the HTMT ratio analysis, as no values exceeded 0.9. The R-squared and R-squared adjusted values describe the percentage contribution of exogenous variables to the change of endogenous variables.

Table 7 shows the results of testing the direct influence hypothesis between constructs. Construct farmers’ characteristics had a direct positive effect on A, SN, and PBC, but did not affect intention. Construct A affects farmers’ intention (I) and entrepreneurial behaviour (EB), with coefficients of 0.283 and 0.350, respectively. The moderation of the study site (Loc2) in construct A significantly affected construct I with a coefficient of 0.478, but did not affect EB. Subjective norms (SN) do not affect constructs I and EB. Loc2 moderation in SN also did not affect constructs I and EB. Construct perceived behavioural control (PBC) positively affected I and EB. The moderation of Loc2 in the PBC construct significantly affected I (coeff. -0.315) but did not affect EB. Independently, Loc2 significantly affected farmers’ intention but not EB. Table 8 shows the results of testing the indirect influence hypothesis. The FC construct significantly affects I and EB through A, which serves as a mediating construct. Construct FC affects I through PBC. Construct FC through PBC, and then it affects EB. The PBC construct indirectly affects EB through I. The moderation of Loc2 in construct A significantly influences EB through I.

The statistical analysis results of the research (Table 7) show that FC can be proposed as a determining construct of A, SN, and PBC. Farmers’ characteristics are reported to affect farmers’ attitudes and knowledge of an innovation (Xu et al., 2025; Yang and Cui, 2025). Farmers’ knowledge correlates with perception (Jansen et al., 2022), which is in line with the results of this study, namely that FC affects PBC. Farmers’ characteristics could affect social interaction and personality traits such as conscientiousness, which could lead improving social norms (Leinmueller et al., 2024; Wang and Xu, 2024).

The results showed that PBC was the strongest predictor of intention (I), followed by attitude (A) and subjective norms (SN), with coefficient values of 0.395, 0.283, and 0.183 (ns), respectively. Interestingly, attitude (A) emerged as the strongest predictor of entrepreneurial behaviour (EB), surpassing SN (ns), PBC, and even intention, with coefficient values of 0.350, 0.164, 0.197, and 0.260. The analysis also indicates that A and PBC mediate the relationship between farmers’ characteristics (FC) and intention, while A and the PBC–I pathway mediate the

Table 7. Direct effect

	Original sample	Sample mean	Standard deviation	t-statistic	p-value
FC→A	0.599	0.604	0.061	9.743	0.000*
FC→I	0.097	0.102	0.056	1.725	0.085
FC→PBC	0.561	0.565	0.072	7.780	0.000*
FC→SN	0.625	0.629	0.066	9.461	0.000*
AC→I	0.283	0.289	0.092	3.088	0.002*
AC→EB	0.350	0.358	0.094	3.712	0.000*
SN→I	0.183	0.173	0.102	1.794	0.073
SN→EB	0.164	0.165	0.108	1.519	0.129
PBC→I	0.395	0.389	0.079	5.002	0.000*
PBC→EB	0.197	0.190	0.098	2.020	0.043*
I→EB	0.260	0.256	0.102	2.557	0.011*
Loc2→I	0.252	0.249	0.085	2.977	0.003*
Loc2→EB	-0.015	-0.012	0.092	0.163	0.870
Loc2×A→I	0.478	0.475	0.130	3.677	0.000*
Loc2×A→EB	0.181	0.172	0.154	1.169	0.242
Loc2×SN→I	-0.137	-0.126	0.147	0.932	0.351
Loc2×SN→EB	0.032	0.033	0.140	0.229	0.819
Loc2×PBC→I	-0.315	-0.309	0.128	2.466	0.014*
Loc2×PBC→EB	-0.238	-0.225	0.147	1.617	0.106

* significance at 5%

relationship between FC and EB. In addition, PBC influences EB both directly and indirectly through intention. The mediating effect of intention on the relationship between attitude and EB is stronger in Banjarnegara than in Purbalingga. These findings suggest that farmers' attitudes play a dominant role, as their entrepreneurial decisions are strongly shaped by personal evaluations of whether such actions are beneficial and aligned with their values. This highlights the need for interventions that strengthen positive perceptions and value orientations—such as training that emphasizes benefits, success stories, and practical demonstrations—to more effectively improve farmers' entrepreneurial behaviour. Farmers' attitude in Banjarnegara Regency affects EB through I, with mediation greater than in Purbalingga Regency. Several results of this study are in line with the research of [Sarma et al. \(2025\)](#) on the behavioural intentions of farmers to adopt livestock interventions for food security, that construct A and PBC have a direct effect on I and behaviour, I affects behaviour, while the difference in the report SN affects I and behaviour. Research by [Faisal et al. \(2020\)](#) on smallholder livestock farming systems states that the SN variable (Coeff.: 0.193) is the strongest predictor for farmers' intention to adopt climate-smart technology, followed by A and PBC (Coeff.: 0.173 and 0.141). [Hou and Hou \(2019\)](#) stated that among farmer respondents with large production scales in China, the PBC construct has a greater influence on I than A, with a coefficient of 0.640 vs 0.590, and the SN construct does not have a significant effect on I. [Karimi and Saghaleini \(2021\)](#) reported that farmers' intentions to conserve grazing land were most influenced by A (Coeff.: 0.58), PBC (Coeff.: 0.28), and SN (Coeff.: 0.11).

In the context of the insignificant influence of SN on I and EB in this study, the results are thought to be due to the strong influence of PBC. [La Barbera and Ajzen \(2020\)](#) stated that higher PBC can reduce the influence of SN on intention. [Balaraj et al. \(2024\)](#) added that if farmers believe they can manage their resources effectively, subjective norms may be less relevant in forming livestock farmers'

intentions towards behaviours. In addition, livestock farmers' social motivation can also influence subjective norms. When the sense of belonging in society is threatened, norms can exert stronger influence, but when that threat is absent, their impact can be reduced. This condition will be more pronounced in an environment emphasising individualism ([Manning, 2011](#)).

Location and its moderating effect on intention and behavior result in different values of those constructs. Different locations have different community conditions, agricultural and livestock commodities, and management of mentoring programs. These differences are suspected to affect the results of this study. These conditions are consistent with [Zhang et al. \(2024\)](#), who state that different geographical conditions lead to differences in attitudes and decision-making. Regional factors can affect the formation of farmers' attitudes, perceptions, and decision-making ([Grover and Gruver, 2017](#)). [Tosun et al. \(2024\)](#) added that differences may arise from regional variations in agricultural policies, which significantly impact living standards, employment conditions, and the environment. These findings also highlight important practical implications, particularly the need for location-specific intervention strategies that strengthen farmers' attitudes and perceived control, while also suggesting several limitations—such as contextual specificity and cross-sectional design—that open opportunities for future research to explore longitudinal dynamics and broader geographic settings.

4. Conclusion

This study concludes that there are differences in characteristics between small ruminant farmers in the highland areas of Purbalingga and Banjarnegara. Farmers in Banjarnegara have stronger subjective norms and more entrepreneurial behaviour than those in Purbalingga. Perceived behavioural control is the strongest predictor of intention, while farmers' attitude is the strongest predictor of entrepreneurial behaviour.

This study recommends that the extension program continue

Table 8. Indirect effect

	Original sample	Sample mean	Standard deviation	t-statistic	p-value
FC→A→I	0.169	0.173	0.055	3.067	0.002*
FC→A→EB	0.210	0.215	0.058	3.626	0.000*
FC→A→I→EB	0.044	0.045	0.025	1.749	0.080
FC→PBC→I	0.222	0.219	0.053	4.196	0.000*
FC→PBC→EB	0.110	0.108	0.058	1.894	0.058
FC→PBC→I→EB	0.058	0.057	0.027	2.104	0.035*
FC→SN→I	0.114	0.108	0.065	1.764	0.078
FC→SN→EB	0.103	0.104	0.070	1.465	0.143
FC→SN→I→EB	0.030	0.027	0.020	1.512	0.131
FC→I→EB	0.025	0.027	0.020	1.285	0.199
A→I→EB	0.074	0.075	0.041	1.812	0.070
PBC→I→EB	0.103	0.099	0.043	2.382	0.017*
SN→I→EB	0.048	0.042	0.030	1.562	0.118
Loc2×A→I→EB	0.124	0.121	0.058	2.132	0.033*
Loc2×PBC→I→EB	-0.082	-0.078	0.046	1.780	0.075
Loc2×SN→I→EB	-0.036	-0.032	0.042	0.844	0.399
Loc2→I→EB	0.066	0.065	0.036	1.837	0.066

* significance at 5%

strengthening attitudes and perceived behavioural control after completing the UPLAND project. This will strengthen farmers' intentions to adopt entrepreneurial behaviour and enable its immediate application in small ruminant livestock businesses in the highlands.

5. Conflict of interest

No potential conflict of interest relevant to this article was reported. All authors have agreed with the contents of the manuscript.

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8. Author's contribution

The authors confirm their contribution to the paper as follows: study conception and design: DNC, KM, MS, YNW, ARSN; data collection: DNC, MS, LS, TRP, IS, ARSN; analysis and interpretation of results: ALL AUTHORS ; draft manuscript preparation: ALL AUTHORS.

9. Ethics approval

This article does not involve animal subjects, so ethical approval for animal studies is not necessary in the present study.

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