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The impact of behavioral attributes on rural youth's propensity to participate in non-primary agribusinesses: Evidence from KwaZulu-Natal, South Africa

Raesetse Baloyi [a], Edilegnaw Wale[b] and Unity Chipfupa[c]

aDiscipline of Agricultural Economics, University of KwaZulu-Natal, Pietermaritzburg, South Africa; bDepartment of Agricultural Economics, Extension and Rural Development, University of Pretoria, Pretoria, South Africa; cDepartment of Agriculture and Animal Health, University of South Africa, Pretoria, South Africa

ABSTRACT

Youth participation in agriculture in general and agribusinesses in particular remains limited in Africa and empirical insight on the enablers and inhibitors is limited. This paper aims to investigate the impact of behavioral attributes (such as entrepreneurial spirit and business skills endowment) on the potential participation of rural youth in non-primary agribusinesses. Principal Component Analysis and Fractional Logit Model were employed on a data set of 152 rural youth. The results show that most rural youth are endowed with entrepreneurial spirit and relatively well capacitated with business skills. The results further show that rural youth endowed with entrepreneurial spirit are less likely to engage in non-primary agribusinesses. Other factors that influence rural youth potential participation included psychological capital, agricultural perceptions, and demographics. The results suggest that interventional programs should consider behavioral attributes when aiming to attract rural youth into the sector.

Introduction

In South Africa, more than 50% of the population is living in poverty with unemployment rates on the rise, especially among the youth (Lehohla, 2016). In the first quarter of 2023, almost half of the youth labor force was without work (Stats, 2023). The increasing rate of unemployment exposes youth to poverty and food insecurity which often results in increased social ills within communities (O'Higgins, 2017). Given the recent impact of the COVID-19 pandemic on the economy, the consistent political dilemmas and the chronic energy challenges that the country is facing, the unemployment rate is likely to remain static at best or get worse in the long run. Therefore, it will remain necessary to explore income-generating opportunities that will enable rural youth to create and sustain their livelihoods.

Researchers continue to position agriculture at the center of employment creation and food security (Adesina & Favour, 2016; Chipfupa & Wale, 2018). This has been proven time and again in various contexts and countries. For instance, lessons from the Green Revolution in India attest to the importance and contribution of agriculture in alleviating poverty and hunger. In South Africa, Nesengani et al. (2016) reported that projects targeting smallholder farmers had a significant impact on food security and the poverty statuses of beneficiaries. This affirms the importance of the sector and further highlights its potential in improving livelihoods, particularly among the youth. However, various studies conducted in Africa and around the globe continue to report very limited engagement of youth in agricultural activities (Adekunle et al., 2009; Akrong et al., 2020; Chipfupa & Tagwi, 2021; FAO, 2014). The majority of these studies indicated that the limited participation emanates from the nature of the job and the limited income opportunities that the sector is perceived to offer. Also, for the majority of the youth, agriculture is equated to production-related activities or primary agriculture, resulting in the perception that participation in the sector will be relatively laborious and require physical labor, both of which are not attractive to the youth (Baloyi et al., 2023; Chipfupa & Tagwi, 2021). This viewpoint of the sector impedes the capacity and willingness of the youth to explore and benefit from the various opportunities along the agricultural value chain.

There are various non-primary value-adding activities and services within the agricultural sector that rural youth can participate in such as the distribution of farm inputs and farm produce, provision of knowledge through acting as farm agents, and arbitraging livestock, among others. These activities have the potential to create livelihoods for the youth while developing and transforming rural economies. Baloyi et al. (2023) confirmed that although rural youth showed limited interest to engage in primary/production-related agricultural activities, they demonstrated interest to engage in non-primary agribusinesses. Baloyi et al. (2023) further identified the youths' low endowment in livelihood assets (e.g. access to land, water, equipment, and financial resources) as the primary constraint hindering their participation in non-primary agribusinesses. The present study focuses on the rural youth's behavioral attributes: entrepreneurial spirit and business skills endowment. The study aims to understand the influence of behavioral attributes on rural youths' willingness and potential to participate in non-primary agribusinesses. Existing studies that acknowledged the influence of behavioral attributes on youth participation in agricultural activities include Chipfupa and Tagwi (2021) and Henning et al. (2022). However, both studies bracketed primary agriculture and non-primary agricultural activities as one, neglecting the differences. Therefore, this study aims to contribute to knowledge by answering the following empirical questions: (i) To what extent is rural youth participation in non-primary agribusinesses influenced by their behavioral attributes, such as entrepreneurial spirit and business skills endowment? (ii) How well endowed are the rural youth with positive behavioral attributes to take advantage of the available opportunities in the agricultural sector? This insight will be beneficial to development practitioners and policymakers in structuring programs that aim to attract and sustain rural youth participation in the sector. The study aims to achieve this through the provision of empirical evidence on the necessary skills, knowledge, and traits required to complement the resources that aim to incentivize youth participation in the sector.

Methodology

Conceptual framework

Partially owing to the failure of neoclassical economics (rationality, optimization, and market equilibrium), behavioral economics is slowly gaining more currency and being integrated in rural development, particularly smallholder agriculture, to assist in understanding farmers' behavioral trends and patterns that influence productivity and profitability. Studies including Chipfupa and Wale (2018) and Wale et al. (2021) have provided the foundation of how behavioral attributes such as entrepreneurial spirit and psychological capital influence farmers' decision-making processes. Similarly, for rural youth, their behavioral attributes influence the decisions they make.

Entrepreneurial spirit, as one of the entrepreneurship dimensions, is considered a mind-set, "an attitude and approach to thinking that actively seeks out change, rather than waiting to adapt to change" (Smith, 2013). Literature measures entrepreneurial spirit in various ways and this includes assessing constructs such as one's ability to: take calculated risks; identify gaps and/or opportunities; embrace change; problem-solving, and being innovative, among other constructs (Maluleke, 2016; Wale et al., 2021). In addition to entrepreneurial spirit, perceptions of oneself, which are closely related to psychological capital, are also important in informing and influencing one's decision-making process. Liñán et al. (2011) called this perceived feasibility. According to the authors, the extent to which one views him/herself as personally equipped to carry out a given activity/responsibility is important in influencing their propensity to engage in that activity/responsibility.

Given the above understanding of behavioral attributes, Figure 1 presents the Conceptual Framework of the study that integrated the Foggs Behavioral Model and the Sustainable Livelihood Framework in explaining the impact of behavioral attributes on rural youth decision-making. According to the model, there are three elements that affect persuasive behavior. One has to have the ability to act on the action (resources/assets), have the motivation (willingness) to take the action (behavioral/internal attributes), and also must have triggers (potential gains) that influence them to take the action (Fogg, 2009). Fogg (2009) further indicates that the three elements have to be simultaneously present for the behavior to occur. Similarly, for rural youth, they need to be well capacitated with behavioral attributes as well as livelihood assets to increase their propensity to engage in any economic activity. Studies that looked at smallholder farmers have indicated that farmers who have assets without the endowment of behavioral attributes do not often run sustainable and profitable enterprises (Chipfupa & Wale, 2018; Zaca et al., 2021). Similarly, one would not expect rural youth with an endowment in assets only, without behavioral traits necessary to navigate the processes of initiating an economic activity, to be willing and able to engage in an economic activity successfully. Therefore, as the model suggests, the simultaneous endowment of behavioral attributes and livelihood assets is equally necessary for influencing one's decision to partake in certain behaviors/actions. Although the study focuses on behavioral attributes, it acknowledges the importance and influence of livelihood assets in affecting youth's propensity to participate in any economic activity.
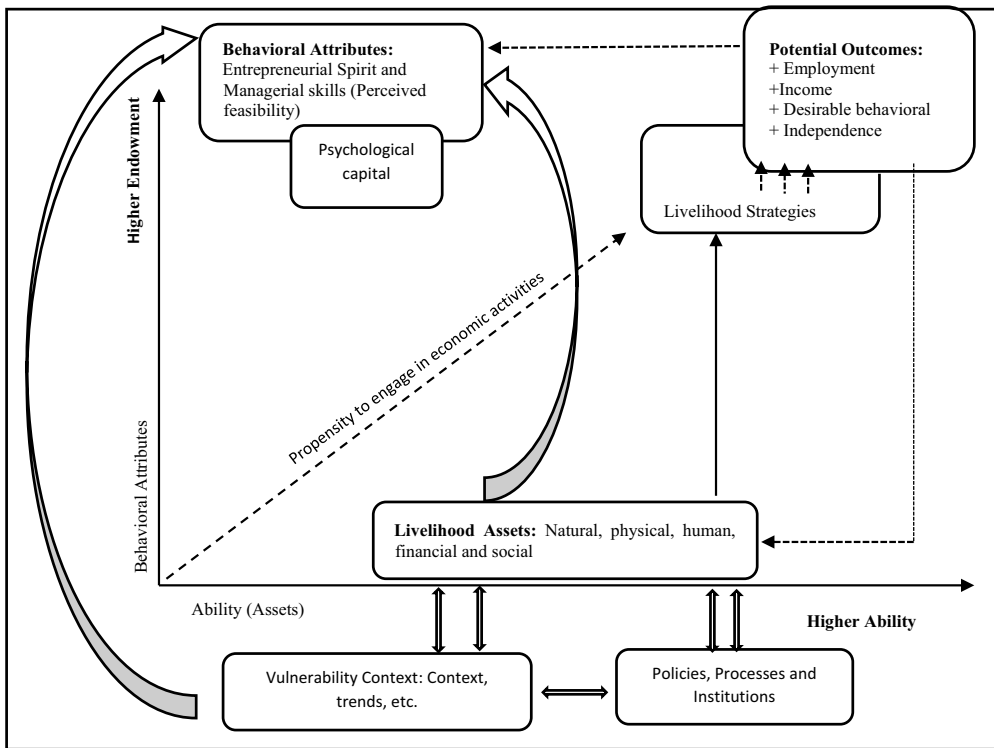
Figure 1. Integrated behavioural and sustainable livelihoods framework. **Source**: Adapted from Fogg (2009) and Zaca et al. (2021).

Study area and data collection

The data used in the study was collected in KwaZulu-Natal province, South Africa. The province has an expanded unemployment rate of almost 50% with youth unemployment at 45.9% (Statistics South Africa, 2021b). It is also the second-largest province with high population statistics and poverty levels (Statistics South Africa, 2021a). The data was collected in two predominantly rural districts in the province, namely, Amajuba and uMzinyathi districts

A combination of purposive and multi-stage random sampling was employed. The study purposefully selected rural youth aged between 18 and 35, following the national youth definition (15–35 years) indicated by the National Youth Development Agency (2015). Youth aged less than 18 years were intentionally excluded from the survey as they are legally deemed minors (Strode et al., 2010). At the first stage of the multi-stage random sampling, two local municipalities were selected from each district. In the second stage, following Krejcie and Morgan (1970), applying a 95% confidence level, 5% margin of error, and 50% response distribution, 218 youth were randomly selected from the local database of about 500 youth provided by the local municipality offices. This method was used in an attempt to minimize sampling bias while providing a narrow framework of the geographically dispersed study site. The data were collected through face-to-face structured interviews conducted by trained local enumerators. A total of 152 youth were successfully

interviewed. Some of the youth were not available for the interviews due to migration, family responsibilities, and personal reasons. This also showed that the lists of youth obtained from the municipalities were not up to date. Hence, the final sample of youth was a fair representation of unemployed youth in the study sites. The data were analyzed using the Statistical Package for Social Sciences 28 (SPSS 28) and STATA 17. Before data collection, ethics approval was obtained from the Humanities & Social Sciences Research Ethics Committee of the University of KwaZulu-Natal (Reference: HSS/1191/018).

Analytical framework

Principal components analysis

Principal Component Analysis (PCA) is a multivariate analytic technique that reduces the dimensionality of interrelated variables while simultaneously retaining the existing variation of the data. This prevents multicollinearity within the data and also makes interpretation of the results relatively easier (Gujarati & Porter, 2009; Jolliffe, 2011). Within a given set of correlated variables, PCA creates orthogonal components where each component is a linear combination of the initial variables. The components are ordered so that the first principal component captures the largest variation within the original variables while the second component measures the second largest variation, etc. Since the PCA produces multiple components, studies in the past used the Kaiser criterion to decide on the number of PCs to retain (Gujarati & Porter, 2009). This criterion states that only components with eigenvalues greater than one should be retained. PCA was used to create indices for entrepreneurial spirit and business skills. These indices, in turn, were used in the Fractional Logit Model as independent variables.

Fractional logistic regression

The model was estimated twice with different dependent variables or measures of youth's potential participation in non-primary agribusinesses. For the purpose of this paper, agribusiness is defined as all activities/operations involved in the production and distribution of farm inputs; production operations at the farm; storage; marketing; and processing of farm produce as well as the distribution of the final product (Davis & Goldberg, 1957) cited by (King et al., 2010). From this definition, non-primary agribusinesses will be defined as non-production related activities within the agricultural sector *i.e* all value-adding services and activities outside primary agriculture." Retailing farm inputs and fresh produce can be viewed as the distribution of farm supplies and farm commodities, respectively. Similarly, services such as acting as a farm agent (provision of farming knowledge) can be viewed as part of the production operations.." The first estimation was done using the proportion of time the youth were willing and able to spend on a particular agribusiness of their choice. The youth had to choose the number of hours within the normal working hours (from 8 am to 5 pm). Time spent on an activity as a measure of participation was also used in other studies such as Akpan et al. (2015). The second estimation was made using the proportion of money the youth were willing and able to contribute (assuming they had the money) toward initiating an agribusiness of their choice. Although we could not find a study that was done using money invested in a business opportunity as a measure of participation, it is essential to note that people only invest in businesses/activities they perceive to be profitable. This means that if youth

are willing to invest more money toward initiating an agribusiness activity, they perceive it to be profitable, and this means that they are more likely to participate in it. The maximum amount of money the youth would contribute was limited to R20 000 (± $1 380[1]) as it is generally the average of a seed grant offered by most government programs and crowdfunding initiatives.

As both dependent variables are proportions, Ordinary Least Squares and other binary methods cannot be used to generate consistent estimates. The other available method often used to analyze proportional dependent variables includes the Fractional Probit Model (FPM). However, the FPM cannot be used in this case as both the proportional dependent variables are not normally distributed. The test results for normality of the dependent variables are reported under Model Specification. Hence, Fractional Logit Regression (FLR) was employed in the study. According to Liu and Xin (2014), the FLR likelihood function can be expressed as:

$$PP = \left[F\left(\beta_{X_i}\right)^{Y_i} \right] \left[1 - F(\beta\ X_i)\right]^{1-Y_i} \text{for} 1 \geq Y \geq 0 \tag{1}$$

where:

PP = Likelihood of potential participation in any agribusiness

B = Vector of estimated parameters

X = Independent variables

Y = Dependent variable

Table 1 details the variables included in the FLR. The results are discussed in the later Sections of the paper. Complex variables including psychological capital and perceptions

Table 1. Variables included in the FLR model.

Dependent variables		
Model 1: Proportion of time the youth are willing to spend		
Model 2: Proportion of money the youth are willing to invest		

Independent Variables		
Variable name	Measure	Expected sign
Risk-taking	PCA Index	-/+
Innovation	PCA Index	-/+
Embrace_Change	PCA Index	-/+
Agricultural training	PCA Index	-/+
Limited business skills	PCA Index	-/+
Poor time management	PCA Index	-/+
Youth Age	Years	+
Youth Gender	Sex of youth (1 = Male 0 = Otherwise)	
Dependency ratio	Ratio of the sum of dependents (i.e. 0–14, above 65 years, permanently sick and/or disabled members of the household) to the working-age group (15–64)	–/+
Household_Agric	Household members engaged in agricultural activities (1 = Yes, 0 = otherwise)	+
Access to credit	Accessed credit in the last 24 months (1 = Yes, 0 = Otherwise)	+
Social Media	Has a social media account (1 = Yes, 0 = Otherwise)	–/+
LogICT	Natural log of the total monetary value (in Rands) of the ICT assets	-/+
Land Access	Youth's access to land (Yes = 1; No = 0)	+
LogWealth	Natural log of the total monetary value (in Rands) of the total non-ICT assets	-/+
Positive Psychological	The sum of the Likert scale scores of 5 positive statements that measure psychological capital	+
Perceptions	The sum of the Likert scale scores of 4 positive statements designating perceptions about agriculture	+

toward agriculture were captured similarly to those of Baloyi et al. (2023). Further to this, Table 2 provides a summary of how the entrepreneurial traits were captured.

Table 2. Entrepreneurial spirit constructs.

Construct Scenarios	Possible responses	Score
Risk-taking		
Suppose you are presented with an investment opportunity with two options. To what extent are you likely to:	choose an investment option with a 50% chance of losing everything and a 50% chance of doubling the investment	
	choose an investment option with 100% guaranteed money back with a 15% return on your investment	
	choose none of the investment options and save your money in a normal Savings account	
Seizing the opportunity		
Suppose you identified a business opportunity within your community that will generate the same remuneration as your current employment. To what extent are you likely to:	quit the job and pursue the business opportunity	
	continue with your employment and ignore the opportunity	
	for any other, please specify	
Creativity and Embracing Change		
Suppose you own a consulting company and on a normal day, you service 10 farmers. On a particular day, you receive requests from 15 farmers. To what extent do you:	work longer hours than usual including weekends to meet the requests	
	cancel the additional 5 farmers and work with the normal load of 10 farmers per day	
	contact a neighbor similar service provider to assist with the additional load.	
Proactive and Problem-solving		
As a youth who has been affected by unemployment, what have you done in an attempt to resolve the problem?	Waiting for opportunities to come	
	Making job applications	
	Decided to pursue my studies/advance my skills	
	Initiated a business/income-generating activity	

Likert scale score 1 = very unlikely, 2 = unlikely, 3 = neutral, 4 = likely, 5 = very likely.
Not all statements are included in the table.

Results and discussion

Entrepreneurial spirit: Descriptives and PCA results

Table 3 summarizes the entrepreneurial traits of the sampled rural youth. Even though the figures could well be inflated due to self-rating bias, on average, the majority of the interviewed youth are proactive, innovative, creative, and embrace change. However, they are not risk-taking. Similarly, literature suggests the same risk profile for the majority of smallholder farmers in rural areas. Reasons for this include lack of up-to-date

Table 3. Entrepreneurial traits of the youth (%).

Dimensions	Yes	Neutral	No
Risk-taking	23.2	4.9	71.9
Embrace change	71.0	3.1	25.9
Seize opportunity	49.5	4.0	46.4
Proactive	83.5	0.9	15.1
Problem-solving	67.4	4.9	27.0
Innovation and creativity	77.7	3.1	19.2

Source: Survey data.

information, limited resources, and exposure to poverty (Domingo et al., 2015; Pannell et al., 2000). It then becomes relevant to assume that the youth as the descendants of the rural smallholder farmers share the same reasoning and perceptions toward risk. Although relatively high-risk opportunities might be associated with higher returns, for rural youth, it might mean risking their livelihoods. This raises an important question as to whether the youth's circumstance-driven risk profile deems them non-entrepreneurial.

PCA was employed on various variables that were used to measure the entrepreneurial spirit of the rural youth and only three PCs with eigenvalues above one were retained. The results are presented in Table 4 . To test the significance of the PCA results, a Bartlett test of sphericity was performed and was found to be statistically significant, indicating that the variables are inter-correlated. Also, a Kaiser-Meyer-Olkin (KMO) test that measures the sampling adequacy was performed and found to be greater than 0.50, indicating that a valid PCA can be applied to the data set.

Table 4. Entrepreneurial spirit indices: PCA results.

	Principal Components		
Variable	PC_1 Embrace change	PC_2 Innovation	PC_3 Risk-taking
Risk-taking	0.388	−0.142	**0.765**
Embrace change	**0.607**	0.031	0.196
Seize opportunity	**0.594**	0.027	−0.330
Proactive	**0.519**	−0.272	**−0.576**
Problem-solving	0.325	**0.619**	−0.055
Innovation and creativity	0.241	**0.732**	0.067
Eigenvalue	1.595	1.175	1.097
% of variance	22.8	16.8	15.7
Cumulative % of variance	22.8	39.6	55.2
Keiser-Meyer-Olkin (KMO)		0.554	

Only component loadings greater than |0.45| were included in the results.
Source: Survey data.

The three retained PCs accounted for 55.23% cumulative variation in the data. The first PC had relatively high loadings on three variables, namely, embrace change, seize the opportunity, and proactive. This represents youth who embrace change that occurs around them, who can seize opportunities when they arise and who are also proactive. The PC was named "Embrace Change." The second PC had relatively high loadings on innovation and creativity, and problem-solving representing youth who are innovative and creative and hence can come up with solutions for addressing challenges they face. The PC was named "Innovation." The third PC had relatively high loadings on risk-taking and proactiveness. However, the two have an inverse relationship, representing youth who are risk-takers but are more reactive (they wait for something to happen first before they act). The PC was named "Risk-taking." The three PCs were included as independent variables in the Fractional Logit Model.

Business skills endowment: Descriptive and PCA results

The success of any business and/or self-employment venture depends on various human capital endowments of the entrepreneur. This includes being sufficiently skilled to successfully manage the business and being endowed with the right mind-set to go through what it takes. Table 5 provides a summary of the business skills endowment of the interviewed rural youth. Generally, the results indicate that the youth are well endowed with business skills but face challenges in time management. It should be noted that some of the attributes that measure business skills including problem-solving are captured through entrepreneurial traits.

Table 5. Managerial skills endowment of the youth (in percentages).

Managerial skills	Yes	Neutral	No
I am able to allocate tasks (delegation)	54.5	14.3	31.2
I prefer planning things before I execute them	92.4	3.6	4.0
I often manage to finish tasks at the time I set to complete the tasks	30.2	9.4	60.4
I prefer to be in leadership positions whenever I am in a group	68.5	8.9	22.6

Source: Survey data.

Table 6 below summarizes the formal education and types of training attended by the rural youth. The minority of the youth have obtained qualifications above Grade 12. Also, a relatively low number of the youth have attended business planning and financial management training. This demonstrates the lack of capacity building and skills development in rural areas. The descriptive results are in line with the International Labor Organization (2023) that skills development in rural areas, particularly among the youth, continues to be a key challenge that often results in difficulties securing income-generating opportunities.

Table 6. Training and formal education endowment of the rural youth (in percentage).

Type of Training/Education	Yes/Attended
Obtained qualification above high school (Grade 12)	25.3
Financial management	8.3
Business planning	8.3
Agricultural training	54.2

Source: Survey data.

Table 7 presents the PCA results used to measure the business skills endowment of rural youth. KMO (0.54) and the Bartlett test of sphericity ($p = 0.000$) indicated the appropriateness of the PCA for the data set. Only four PCs were retained and accounted for 60.9% of the cumulative variation in the data. The first PC had relatively high loadings on financial record-keeping training, business plan training, and the ability to delegate. However, financial record-keeping and business plan training had opposite signs to the ability to delegate. This component represents youth who have not attended record-keeping and business planning training but possess the ability to delegate tasks. The PC was named "Limited business skills." The second PC had relatively high loadings on two

Table 7. Managerial skills indices.

Variable	PC$_1$ Limited business skills	PC$_2$ Confidence	PC$_3$ Agricultural Training	PC$_4$ Poor time management
		Principal Components		
Formal education	−0.088	0.399	**0.475**	0.305
Agricultural training	−0.113	−0.077	**0.769**	−0.157
Financial record-keeping training	**−0.703**	0.081	−0.207	−0.317
Business plan training	**−0.694**	0.139	−0.340	0.169
Leadership training	0.311	**0.697**	−0.085	−0.040
Self-confidence	−0.165	**0.802**	−0.105	−0.011
Time management	0.063	−0.097	−0.121	**-0.893**
Planning skills	0.056	0.452	0.291	−0.115
Ability to delegate	**0.683**	−0.116	0.335	0.208
Eigen value	1.797	1.524	1.085	1.038
% of variance	19.9	16.9	12.1	11.5
Cumulative % of variance	19.9	36.9	48.9	60.9
Keiser-Meyer-Olkin (KMO)	0.544			

Only component loadings greater than |0.45| were included in the results.
Source: Survey data.

variables, namely, self-confidence and leadership training. This component represents youth who are confident and have attended leadership training. The PC was named "Confidence."

The third PC had high loadings on two variables, namely, agricultural training and formal education representing youth who have received agriculture-related training and have relatively higher levels of formal education. The PC was named "Agricultural training." The fourth PC had a high loading on time management. This component represents youth who cannot manage their time properly and the PC was named "Poor Time Management." The PCs were included in the Fractional Logit Model as independent variables. However, the PC named "Confidence" was excluded because it is already accounted for by the variable "Psychological capital" reported in Table 1.

Model specification tests

To ensure that the two models were correctly specified, various post-estimation tests were performed. Wald X^2 tests for both models were statistically significant at 1%, indicating that the FLMs correctly fitted the data. Also, the mean VIF for the independent variables was 1.23, indicating that the variables were not correlated. Breusch–Pagan tests for heteroskedasticity were statistically not significant, showing that the data is homoskedastic. Shapiro–Wilk tests for normal distribution were also statistically significant at 1%, indicating that the dependent variables used in both models were not normally distributed.

Fractional logit models: Results and discussion

Table 8 shows the mean values of the two dependent variables in both absolute and proportional terms together with their respective standard errors. The study is based on youth-stated preference decisions because of the limited actual participation of rural

Table 8. Summary of the dependent variables.

Variable name	Mean of absolute value	SE	Mean of proportion	SE
Time (hours)	6.20	0.199	0.668	0.023
Money (Rand)	9 066.36	525.90	0.554	0.643

Source: Survey data.

youth in non-primary agribusinesses in the province. Hypothetically, the youth were willing to spend, on average, 6.2 hours of their normal working day on non-primary agribusinesses of their choice while, if they had R20 000, they were willing to invest about 45% (R9 066.4) toward initiating an agribusiness of their choice. The results of the two models are presented in Table 9. Throughout the discussion of the FLM results, the proportion of time and the proportion of money the rural youth were willing to spend/ invest toward a non-primary agribusiness activity of their choice are meant to designate their potential participation.

The variables "Innovation," "Limited business skills," "Age," "Psychological capital," and "Perceptions" were found to be statistically significant in affecting rural youth potential participation in non-primary agribusinesses in both models, *ceteris paribus*. Agricultural training and poor time management skills were statistically significant in Model 1 only while gender and household wealth were found to be statistically significant in Model 2

Table 9. Fractional logit results.

	Dependent variable			
	The proportion of time (Model 1)		The proportion of money (Model 2)	
Fractional Logit Model Variables	B	dy/dx	B	dy/dx
Risk-taking	0.109	0.039	0.036	0.013
Innovation	−0.120**	−0.077	−0.172**	−0.066
Embrace_Change	−0.043	−0.016	−0.007	−0.003
Agricultural training	0.069*	0.017	0.064	0.029
Limited business skills	−0.136*	−0.039	−0.143**	−0.052
Poor time management	−0.181**	−0.050	−0.038	−0.023
Youth Age	0.039**	0.011	0.029**	0.008
Youth Gender	0.107	0.024	0.268*	0.101
Dependency ratio	−0.058	−0.023	−0.024	0.054
Household_Agric	−0.069	−0.030	0.0615	0.057
Access to credit	−0.170	−0.068	−0.054	−0.062
Social Media	0.138	0.047	0.0250	0.029
LogICT	0.045	0.033	0.042	0.001
Land access	0.086	0.034	0.004	0.005
LogWealth	−0.009	−0.004	−0.075**	−0.022
Positive Psychological	0.050***	0.011	0.041***	0.014
Perceptions	0.106***	0.037	0.110***	0.040
Constant	−4.960		−0.914	
Pseudo R^2	0.110		0.084	
Wald X^2	55.47		53.75	
Prob > chi^2	0.000***		0.000**	
Log pseudo-likelihood	−93.693		−95.482	
VIF (mean)	1.23		1.23	
Breusch-Pagan (*p-value*)	0.7166		0.865	
Shapiro-Wilk (*p-value*)	0.000***		0.000***	
Number of Observations	152			

*,**, & *** denote the level of significance at 10, 5, and 1%, respectively.
Source: Survey data.

only. Innovation, as one of the entrepreneurial constructs, was found to have a negative relationship with the potential participation of rural youth in non-primary agribusinesses, in both models. Unlike *priori* expectations, the results suggest that youth who are innovative, creative, and problem-solving have limited potential to participate in non-primary agribusinesses. This suggests that rural youth endowed with entrepreneurial spirit are less likely to participate in non-primary agribusinesses. This could be because such youth are attracted to jobs and business opportunities in other sectors. The findings are similar to those of Kusis et al. (2014) and Henning et al. (2022) who all found that better entrepreneurial individuals prefer opportunities in other sectors, relative to opportunities in the agricultural sector. This complicates the idea of employing entrepreneurship as a vehicle for transforming smallholder agriculture and addressing rural poverty/food insecurity.

Furthermore, the results indicate that limited business skills negatively affect rural youth's potential participation in non-primary agribusinesses in both models. This means that youth who have not attended financial record-keeping and business planning trainings have limited potential to participate in non-primary agribusinesses. Lack of record-keeping and the absence of a business mind-set are the two most important reasons why smallholder farmers fail to act and think like entrepreneurs. This is in line with Herrington et al. (2017) who found that the lack of business skills among the youth contributes significantly to their limited engagement in self-employment activities. Both models show a positive relationship between age and potential participation. This suggests that as youth get older, they start losing hope of securing alternative non-agricultural opportunities and begin to "settle" for agriculture-related activities. Also, it might be that as they age, there is increased pressure to secure income to meet family needs. The results complement findings by Baloyi et al. (2023) and Chipfupa and Tagwi (2021) who both found a positive relationship between youth age and participation in agricultural activities. Akpan et al. (2015) also showed that age is associated with better participation in agriculture.

Positive psychological capital has been found to have an affirmative effect on the potential participation of rural youth in non-primary agribusinesses, in both models. This suggests that youth who are optimistic, hopeful, confident, and resilient have a higher probability of participating in non-primary agribusinesses. This confirms results of Baloyi et al. (2023) who found that youth endowed with positive psychological capital are confident enough to engage in a sector viewed as "low status." In addition, the authors indicated the importance of resilience when one engages in activities in agriculture given the nature-dependence of the sector and the risk associated with it. Also, Maluleke (2016) pinpointed resilience and confidence as important traits for individuals engaging in self-employment opportunities. He accentuated that one's ability to bounce back when faced with challenges and obstacles is a determining factor in initiating and maintaining any income-generating economic activity.

Favorable perceptions about agriculture and agricultural opportunities have desirable influence on the potential participation of rural youth in non-primary agribusinesses, in both models. This is in agreement with Magagula and Tsvakirai (2020) and further complements the Theory of Reasoned Behavior by Fishbein and Ajzen (2011) and Montano and Kasprzyk (2015). According to the theory, the way one perceives an activity affects his/her behavior toward that activity. If young people perceive non-primary

agribusinesses positively and consider them viable livelihood options, they are more likely to engage in them and *vice versa*.

In Model 1, rural youth who received agriculture-related training are more likely to participate in non-primary agribusinesses, relative to their counterparts. Such youth also have relatively high levels of formal education. The positive relationship can be that the educated youth perceive themselves to have the necessary skills and knowledge to take advantage of available opportunities in the sector such as to provide agribusiness services, confirming the importance of perceived feasibility. Also, given the time they spent on skills development and acquiring cognitive knowledge, the opportunity cost of them not utilizing these skills is relatively high. Although there are no available studies that investigated the combined impact of agricultural training and formal education on potential participation, several studies that examined the individual role of these variables have often shown their positive relationship with participation in agriculture (Abdullah et al., 2012; Ahaibwe et al., 2013). Model 1 further shows that "Poor time management" has a negative effect on the potential participation of rural youth in non-primary agribusinesses. This is as expected given the enormous time that young people spend on electronic devices and social networks. Also, agricultural activities are often time-bound, meaning that youth who do not know how to manage their time might find it difficult to cope with what these activities entail while still participating in other undertakings.

In Model 2, variables gender and household wealth were found to have a significant effect on rural youths' potential participation in non-primary agribusinesses. Rural male youth are more likely to participate relative to females. This is in contrast with studies by Akpan et al. (2015) and Bezu and Holden (2014) who found that females have better participation in agricultural activities relative to males. This was said to be the case due to the relative ease of males migrating to urban areas in search of work opportunities. However, the opposite relationship found in this study might be that given the persistent unemployment and also considering the social and cultural pressure imposed on males as providers of their families force them to engage in any available income-generating activity including opportunities in the agricultural sector. Household wealth has a negative effect on rural youths' potential participation in non-primary agribusinesses. This is in agreement with Zizzamia (2018) who indicated that youth from relatively wealthier families have enough financial support to explore other opportunities in urban areas and are also under no pressure to contribute financially to their families. As a result, they might see the opportunity cost of waiting for what they perceive as a better opportunity relatively low.

Conclusion and recommendations

The objective of the study was to examine the impact of behavioral attributes on the potential participation of rural youth in non-primary agribusinesses. The fractional logit regression results indicated that youth with entrepreneurial traits are less likely to choose self-employment activities within the agricultural sector. This means that young people better capacitated to initiate and manage successful businesses are more likely to establish businesses in other sectors. The study recommends agricultural awareness programs in rural areas that will expose and attract the youth, particularly those well endowed with behavioral attributes, to various opportunities within the agricultural sector. This is to also

influence and correct the misperception that the majority of rural youth have regarding opportunities in the sector.

Also, the results indicated the importance of business management skills in influencing youth participation in the sector. The study recommends development programs in rural areas that are tailor-made for the specific needs of youth. This can be through initiatives like training, seminars, job shadowing, and internships that will not only expose the youth to relevant concepts/principles but also expose them to the practical use of business skills in successful agribusinesses. Other factors that were found to affect potential participation include demographics and the resource base of the youth. This means that, generally, initiatives that aim to attract the youth to non-primary agribusinesses (and the agricultural sector in general) should focus not only on improving the physical resources but also on the personal and cognitive attributes of the youth. These initiatives are not in any way the responsibility of external parties only. Rural youth themselves have to also take the initiative to improve their personal attributes through actions including free online learning and voluntary work in nearby agribusinesses.

Study limitations

The study acknowledges the limitations and implications of the "stated-preference" method used to collect and capture key variables in the study. The method was used due to the limited actual participation of rural youth in non-primary agribusinesses in the study areas, thus it was not possible to employ the "revealed preference" method.

Note

1. The US$ to ZAR rate at the time of data collection was 1:14.5.

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ORCID

Raesetse Baloyi http://orcid.org/0000-0002-4228-9354

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