Towards identifying enablers and inhibitors to on-farm entrepreneurship: evidence from smallholders in KwaZulu-Natal, South Africa

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ABSTRACT

Enabling on-farm entrepreneurship is an important step to enhance the contribution of smallholder agriculture to rural employment and poverty reduction in South Africa. Using attributes derived from positive psychological capital as proxies for entrepreneurship and data collected from 458 smallholders in and around irrigation schemes in KwaZulu-Natal, the study empirically examines factors affecting smallholder engagement in entrepreneurship activities. Findings show that access to extension and information from scheme committees, being a male farmer, having more earned income, membership to a cooperative and access to markets have a positive effect on farmers' entrepreneurial behaviour. Factors inhibiting entrepreneurship in the context of smallholder farming include land tenure insecurity, access to land without the necessary complementary resources, consumption credit and staying far away from irrigation schemes. The study recommends addressing gender bias regarding access to resources and information. Promoting interactive learning through networking will also result in positive entrepreneurial behaviour. There is also a need for the provision of demand-driven extension services, facilitation of market linkages and enhancing access to finance for would-be entrepreneurs. Access to credit should be directly linked to agricultural production through input vouchers and value chain financing. Addressing land tenure issues along with access to other complementary resources, inputs and services will also enhance on-farm entrepreneurship in the smallholder agriculture sector.

1. Introduction

The need for more entrepreneurship research and development in agriculture is receiving more currency (Alsos et al., 2011). Limited understanding of what influences the development of entrepreneurship in the sector could be linked to its low performance and declining contribution to rural livelihoods and economic growth (Sinyolo et al., 2017; Fanadzo, 2012). Traditionally, entrepreneurship research has concentrated on the manufacturing, technology and service sectors and seldom on the agricultural sector (Bauernschuster et al., 2010; Alsos et al., 2011). However, in the past decade, scholars from agricultural economics and rural sociology have started giving more attention to entrepreneurship theory and practice in agriculture. Even so, the greater concentration of the research has been on farm-based ventures which are not necessarily connected to the farming enterprises (Grande, 2011; Jervell, 2011). Despite a lot of discussion about ‘agriculture as a business’, little is known about entrepreneurialism in the agricultural sector. This is even profound in the smallholder sector with the absence of a record-keeping culture and business mindset, and the lack of a clear distinction between farm and family operations (Wale and Chipfupa, 2018).

Several theories explain the foundations upon which entrepreneurship takes place, namely, growth-oriented, economic, resource-based, opportunity-based, subsistence/survival and psychological theories (Harris, 1971; Alvarez and Busenitz, 2001; Anderson and Miller, 2003; Ratten et al., 2019; McClelland and Winter, 1969; Berner et al., 2012). The theories explain that entrepreneurial intentions are formed from the need to pursue economic profits, exploit business opportunities or meet basic family requirements. In some cases, entrepreneurial behaviour is a function of endowment with specific traits that enhances one’s entrepreneurial spirit (the drive to be entrepreneurial) (Kerr et al., 2018). Given that most of the literature is about mainstream or neoclassical theories of entrepreneurship, it is not clear how these theories would be relevant to the smallholder agricultural sector. Studies show that smallholders are risk-averse and exhibit satisfying behaviour, attributes contrary to the mainstream entrepreneurship ideals (Boahene, 1996; Kahan, 2013). That is why there is still a debate on the suitability of agriculture
as a sector to study how entrepreneurial competence can be identified, characterized, developed and promoted (Lans, 2009). However, even though the context is different, there is evidence from developed countries that smallholder farmers can be classified as business owners and entrepreneurs (McLwee, 2006; Richards and Bulkley, 2007). This means that, with the appropriate institutional support, opportunities do exist for smallholder farmers to be entrepreneurs. That being said, the major challenge remains on how to develop their entrepreneurial skills and manage their farming operations as a business (Vesala et al., 2007).

Smallholder agriculture is at the core of any strategy aiming to improve the living standard of the rural poor (Hazzell et al., 2007). In South Africa, the policies towards inclusive growth and development of rural livelihoods are dependent on the revitalization of the smallholder agriculture sector, particularly irrigation farming (DAFF, 2015; National Planning Commission, 2011). However, despite its potential, the sector has not performed as expected due to a plethora of challenges, among which is the lack of entrepreneurial and managerial skills (Chipfupa and Wale, 2018b; Sinyolo et al., 2017). According to the Global Entrepreneurship Monitor (GEM), the agricultural sector in the country contributes only 2.9% of new business ventures (Herrington and Kew, 2017). Though South Africa’s agricultural strategy aims to integrate subsistence farmers into the commercial agricultural economy, the level of entrepreneurial spirit is not where it should be (Foxcroft et al., 2002). Among other factors, the weak entrepreneurship performance could be associated with low levels of human capital endowment and weak support structures for business development and financial support (Foxcroft et al., 2002; Herrington and Kew, 2014). Promoting entrepreneurial behaviour in the sector, among other solutions, could pave the way for improving the smallholder farmer performance and scaling up the impacts of irrigation schemes and other rural development interventions.

Cultivating rural entrepreneurship is one natural choice to benefit the poor and create more jobs in rural areas. There have been calls for more focus on entrepreneurship to ascertain how it influences economic growth and development (Naudé, 2011). In smallholder farming, more research is needed on opportunities and constraints for developing/growing the entrepreneurial spirit. Evidence from years of research shows that entrepreneurship among small-business owners is often driven by passion, innovation, job dissatisfaction, the need to earn more income, poverty, opportunities and growth prospects (Giotsopoulos et al., 2017; Fairlie and Fossen, 2018). In rural areas, non-farm entrepreneurial behaviour is determined by factors such as access and rights to land, access to credit and markets, labour availability, household wealth and socio-demographic characteristic of the entrepreneur (Efobi et al., 2019; Nagler and Naudé, 2017). However, empirical evidence on the theory and practice of entrepreneurship in smallholder agriculture is almost non-existent and at most anecdotal. Díaz-Pichardo et al. (2012) state that research on the development of entrepreneurial and organisational competency among farmers is notably scarce. Only a few studies have attempted to explain entrepreneurship or entrepreneurial behaviour of small farmers (Cele and Wale, 2020; Sinyolo et al., 2017).

The study argues that it is not clear how smallholder farmers conform to the ideals of mainstream entrepreneurship theories. This is because most operate in a world of imperfect information characterized by ambiguity and uncertainty which affects their decision making and willingness to take risks (Wale, 2012; Boahene, 1996). This, together with the cognitive and non-cognitive challenges of understanding and processing information, limits their propensity to engage in entrepreneurship. The literature on the psychology of entrepreneurship predominantly focuses on personality traits (Frese and Gielnik, 2014). Much of the development economics literature has demonstrated that neoclassical economies does not conform to smallholder behaviour. More recently, behavioural economics has been applied as a useful framework to explain their behaviour (Timmer, 2012; Duflo et al., 2008). Therefore, for a better understanding of on-farm entrepreneurship, there is a need to integrate psychological capital, i.e., the farmers’ mindset, in the measurement of their entrepreneurial spirit (Phakathi and Wale, 2018). How the farmers utilize assets at their disposal or available opportunities will greatly depend on their endowment with positive psychological capital (Chipfupa and Wale, 2018b; Tyson et al., 1994). Thus, the study argues that smallholder farmers’ entrepreneurial spirit must be derived from their positive psychological capital endowment. Furthermore, smallholder heterogeneity suggests that the path to entrepreneurial development for smallholders could be different depending on their features and typologies (Chipfupa and Wale, 2018b). Development practitioners and policy-makers often assume that smallholders are a homogenous group which is one of the hurdles to entrepreneurship development in smallholder farming.

The study will attempt to fill these knowledge gaps by assessing what drives smallholder farmers’ entrepreneurial spirit and hence their ability to take advantage of opportunities in smallholder farming. It seeks to address questions including: What enables smallholders to be entrepreneurs? What inhibits their entrepreneurial drive? What institutional arrangements and services are required to make the farmers more entrepreneurial? Addressing these questions will assist in mapping the entrepreneurship development pathways for smallholder farmers in agriculture and enhance the contribution of the sector.

2. The relationship between entrepreneurship and positive psychological capital

Psychological theories (trait, locus of control and need for achievement) provide the foundation for studying entrepreneurship from a psychological perspective (Kerr et al., 2018). Entrepreneurs are known to be confident people with an internal locus of control, driven by the need to succeed (Kerr et al., 2018; Frese and Gielnik, 2014). The level of these qualities at any given time defines the person’s mindset, also known as positive psychological capital endowment (Luthans, 2004). Such an individual is characterized by confidence in terms of their ability to affect his/her livelihood, positive outlook of the future, perseverance even in the face of adversities and resilience (Luthans et al., 2015).

The study posits that psychological capital is at the centre of decisions to pursue entrepreneurship and often conditions the way people think, act, and react, despite environmental and contextual challenges. Recent efforts to integrate psychological capital to the sustainable livelihoods framework (SLF) have shown that entrepreneurial individuals are better endowed with positive psychological capital (Chipfupa and Wale, 2018b; Phakathi and Wale, 2018). Positive psychological capital (or lack of it) can partly be innate and partly learned (formally or informally) (Simons and Buitendach, 2013). When acquired, it empowers the capability to persevere amid challenges and bounce back from failure. Smallholders who are endowed with this form of capital should not only be able to enhance their general level of well-being but also tend to develop the tenacity necessary to endure through the entrepreneurial process (Hmieleski and Carr, 2008).

People endowed with positive psychological capital are drivers of collective action arrangements. Research has demonstrated that such individuals tend to convince and attract other like-minded persons to which them, in turn, increases the likelihood of creating long-lasting friendships and networks (Fredrickson, 2001). These interactions and connections help such individuals enhance their capacity, enabling them to be resilient to stress and to thrive in challenging and demanding working environments in which others may find overwhelming (Keyes and Haidt, 2003). Similarly, past studies have shown that having hope is positively related to life satisfaction, and it fights against psychological distress (Valle et al., 2006). Thus, hopeful farmers are expected to be more positive about what the future holds and enterprises, with a willingness to face unpredictable events and shocks. This shows their high-risk propensity, an attribute common among entrepreneurs (Díaz-Pichardo et al., 2012). Scheier et al. (2001) also demonstrated a positive relationship between optimism and well-being while Chipfupa and Wale (2018a) have shown that self-confidence positively affects the aspirations of smallholder farmers to expand their farming operations. As
noted above having self-confidence is strongly linked to one's internal locus of control.

3. Conceptual framework

The opportunities and constraints regarding entrepreneurship in smallholder agriculture can be analysed using the SLF (De Satge, 2002). The framework embraces most of the dimensions of entrepreneurship and can be used to explore the relationship between access to resources and entrepreneurship or the difference between opportunity/growth-oriented and necessity/subsistence/survival entrepreneurs (Malauleke, 2016; Berner et al., 2012). The foundation of the conceptual framework of this study focuses on people's strengths, opportunities and constraints rather than needs and expectations, seeking to build on their endowments and poverty-reducing potential (Hasnip et al., 2001). The central factor of this thinking is the farmer's entrepreneurial spirit. This drive is a reflection of their psychological capital endowment comprising of their self-confidence, optimism, hope and resilience (Chipfupa and Wale, 2018b). As discussed above (Section 2), a positive psychological capital is critical for one to develop a strong entrepreneurial mindset which, in turn, is required to unlock entrepreneurship.

Given their endowment with livelihood assets (human, social, physical, natural and financial) and capabilities, smallholder farmers make entrepreneurial decisions regarding their farming businesses. Their entrepreneurial drive and asset endowment determine the range of livelihood opportunities they can recognize and hence the possible on-farm entrepreneurial activities they can undertake. From a resource endowment point of view, the entrepreneur will successfully compete if he or she develops and maintains unique capabilities to take advantage of opportunities and neutralise risk (Barney, 1991). Thus, access, control, and ownership of resources (such as land, labour, water, technology and finance) enable individual farmers to engage in on-farm entrepreneurship (Nagler and Naudé, 2017; Efobi et al., 2019). For example, the lack of title deeds inhibits farmers from investing in the land and accessing finance (Kahan, 2013), thereby limiting their ability to take up new opportunities. The ultimate result is a constrained development of entrepreneurial behaviour.

The study envisages social capital, just like other physical assets, playing a vital role in on-farm entrepreneurship. Interpersonal relationships and social networks allow access to resources (including information) that are not possessed internally (Anderson and Jack, 2002; Liao and Welsch, 2005). Day-Hookoomsing and Essoo (2003) posits that the lack of networking isolates farmers from viable linkages and affects rural entrepreneurship. Similarly, the quality of human resources is critical to the execution of the entrepreneurial function (Schumpeter, 1942). Among resources that an individual farmer possesses are also entitlements or claiming rights mostly made against the state, religious groups and family members (De Wet et al., 2003). For example, in South Africa, such entitlements or expectations include social grants, input support programmes and remittances, among others. It is not clear from past research how such social transfers could affect entrepreneurship. The empirical evidence is of mixed nature. Whilst some studies have shown that they could affect the motivation to work (Chipfupa and Wale, 2020; Sinyolo et al., 2017), others have shown otherwise (Daidone et al., 2019).

Entrepreneurship also requires an enabling environment that cultivates and unlocks the drive. Hence, policies and institutions are critical in facilitating the entrepreneurship process and embracing new ideas, practices, technologies, and markets. Equally important is an assessment of the vulnerability context, i.e., trends, shocks and stresses, in which the assets, activities and capabilities operate (De Satge, 2002). The study uses this conceptual imperative to model what affects on-farm entrepreneurship in smallholder agriculture.

4. Research methodology

4.1. The study area

The study was conducted in three rural communities of KwaZulu-Natal province, South Africa, i.e., Jozini, Msinga and Nongoma. Census 2011 data showed that KwaZulu-Natal is the second-highest populated province in the country with a population size of 11,289,086 (19.2 percent of the country). The population is slightly female-dominated (52.5%) and younger than 30 years (58.5%) (Statistics South Africa, 2019a). About 21.9% of the people in the province have no schooling and 54% reside in the rural areas (Statistics South Africa, 2014b). The recent statistics from Statistics South Africa (2019b) reported youth unemployment to be at 39.6 percent. Poverty levels in the province are high with statistics showing that in 2011, 26.3% of all poor people in South Africa lived in KwaZulu-Natal (Statistics South Africa, 2014a). Consequently, there is a strong dependency on social grants in the study areas.

Smallholder agriculture is an integral part of the livelihoods of rural people in the province. However, the agricultural potential is affected by low rainfall which ranges between 500-850mm per annum. The participating farmers came from communities in and around four irrigation schemes (Jozini-Makhathini and Ndumo-B; Msinga – Tugela Ferry; and Nongoma – Bululwane). The schemes constitute part of the government’s smallholder irrigation revitalization programme. Their sizes range from 184ha-4500ha of land. Land allocation is either as an individual or as a cooperative, and its size depends on the scheme. Smallholders in the schemes operate between 0.1 – 10 ha depending on the scheme and whether they farm independently or as a cooperative. Those outside the schemes generally have larger pieces of land. The land is generally held on a permission to occupy basis, but other land leasing arrangements also exist among farmers.

4.2. Data collection

The data were collected using a semi-structured questionnaire. The questionnaire covered farmer characteristics and other social demographics, capital endowments (covering all livelihoods assets), constraints in farming and farmer’s perceptions of their entrepreneurial characteristics. Data were collected in phases from 2015-2016 by six enumerators who spoke fluent IsiZulu, the local language. This approach reduced the challenges resulting from research fatigue and increased the reliability of the data. Pre-testing of the questionnaire was done to ensure that no questions were ambiguous and culturally sensitive.

A stratified random sampling technique was used to select the respondents. The questionnaire was administered to farmers in and around the irrigation schemes. The total number of farmers that were interviewed is 458, comprising of 197 scheme irrigators, 72 independent irrigators, 80 home gardeners, 56 community gardeners, and 53 rain-fed farmers. The sampling frame for scheme irrigators and rain-fed farmers was obtained from cooperatives and extension officers. However, since no prior information was available regarding independent irrigators, home and community gardeners, they were identified during the survey. Given the sampling approach for these farmers, caution should be taken when extrapolating the results to other similar farmers across the province or country. The results, however, provide a basis for evaluating opportunities and constraints to entrepreneurship among smallholder farmers.

4.3. Analytical framework

4.3.1. Deriving the dimensions of on-farm entrepreneurship

The study employed the Principal Component Analysis (PCA) technique to derive three different dimensions or principal components as
indices of on-farm entrepreneurship. The indices were obtained from a set of 12 questions that sought to collect data on the common entrepreneurial attributes such as risk-taking, seizing opportunities, innovation, competitiveness and independence (see Table 1). The approach was deemed appropriate for this study given the ability of PCA to reduce the dimensionality of several variables to a few uncorrelated factors that represent most of the characteristics of the original variables. Following Manyong et al. (2006), the PCA for this study was expressed as follows:

Let the following matrix represent the relationship between the proxies of on-farm entrepreneurship and a set of explanatory variables for a group of farmers:

\[
\begin{bmatrix}
Y_1 \\
. \\
. \\
. \\
Y_n
\end{bmatrix}
= \begin{bmatrix}
\alpha_1 \\
\alpha_2 \\
\vdots \\
\alpha_k
\end{bmatrix}
+ \begin{bmatrix}
\beta_1 \\
\beta_2 \\
\vdots \\
\beta_k
\end{bmatrix}
X + \begin{bmatrix}
\epsilon_1 \\
\epsilon_2 \\
\vdots \\
\epsilon_n
\end{bmatrix},
\]

(1)

where \(Y_1 \ldots Y_n\) are set of \(n\) dependent variables measuring on-farm entrepreneurship expressed as a function of a vector of explanatory variables \((x)\) with parameter estimates \((\alpha_1 \ldots \alpha_k)\), intercepts \((\beta_1 \ldots \beta_k)\) and error terms \((\epsilon_1 \ldots \epsilon_n)\). It is assumed that \(Y_1 \ldots Y_n\) harbour a latent variable of the original observable dependent variables on the left-side whose coefficients could be estimated through linear structural equations.

Applying PCA on the left-hand side of Eq. (1) above results in Eq. (2).

\[
\begin{bmatrix}
Y_1 \\
. \\
. \\
. \\
Y_n
\end{bmatrix}
\cong \begin{bmatrix}
P_1 \\
P_2 \\
. \\
. \\
P_k
\end{bmatrix}
= \begin{bmatrix}
\alpha_1 \\
\alpha_2 \\
\vdots \\
\alpha_k
\end{bmatrix}
+ \begin{bmatrix}
x_1 \\
x_2 \\
\vdots \\
x_k
\end{bmatrix}
+ \begin{bmatrix}
\epsilon_1 \\
\epsilon_2 \\
\vdots \\
\epsilon_n
\end{bmatrix},
\]

(2)

where \(P_1 \ldots P_k\) are components with eigenvalues greater than 1 and \(k < n\). \(k\) can take the value of 1 meaning that only one factor is retained. However, \(k\) can also be greater than 1 as observed in this study were three factors where retained (see Table 3). The three were used as dependent variables in the empirical models assessing factors that affect entrepreneurship of smallholder farmers as indicated in Section 4.3.2 below. Also, in constructing the proxies for on-farm entrepreneurship, questions on entrepreneurial characteristics were designed to reflect key aspects of psychological capital, i.e. self-confidence, hope, optimism and resilience. This was informed by some earlier work by Luthans et al. (2004) which was adapted to smallholders by Chipfupa and Wale (2018b).

4.3.2. The empirical model

The study estimated a multivariate regression model on the three principal components obtained through the PCA. The multivariate regression model is a special case of the seemingly unrelated regressions model with the same set of variables. It uses a single regression model to fit several outcome variables. The analysis could be done using separate ordinary least squares regression models. However, this would ignore an important possibility, i.e., the residuals of the equation, in this case, the three entrepreneurship indices, could be correlated. Utilizing the cross-equation correlation of the residuals potentially produces more efficient parameter estimates (Cameron and Trivedi, 2010). Following Greene (2012), the generic formulation of the multivariate regression model is expressed as follows:

Let \(M\) be the on-farm entrepreneurship equations with different dependent variables estimated using a sample of data with \(T\) observations.

\[
y_1 = \beta_1 X_1 + \epsilon_1,
\]

\[
y_2 = \beta_2 X_2 + \epsilon_2,
\]

\[
y_M = \beta_M X_M + \epsilon_M,
\]

then this multivariate regression model can be written as

\[
y_i = \beta_i X_i + \epsilon_i, \quad i = 1, \ldots, M.
\]

(4)

The model assumes that the residuals have a zero mean (strict exogeneity of \(X_i\)), are homoscedastic and uncorrelated across observations but correlated across equations. The \(T\) observations are used to estimate the \(M\) equations and each equation has \(K_i\) regressors that are similar across all the three equations and \(T > K_i\) (Greene, 2012). We used the Breusch-Pagan test to check for the independence of the residuals of the three on-farm entrepreneurship equations. Multicollinearity among the explanatory variables was checked by looking at their variance inflation factors whilst the control function approach, proposed by Wooldridge (2015), was used to control for potential endogeneity between the outcome variables and the proportion of earned income. The process for controlling for endogeneity involved the estimation of the reduced form equation for the proportion of earned income and then predicting the residuals. The residuals were then included in the full model to act as a control function and render the proportion of income variable exogenous.

4.3.3. Independent variables included in the regression models

Table 2 presents the independent variables that were included in the empirical model. GENDER (1 = male, 0 = otherwise) is included as a regressor given the existing cultural practices of gender stereotyping in South Africa that place women at a disadvantage. EDUC shows the farmer’s (household head) completed years of schooling. Age (AGE) of the farmer is expected to have an exponential relationship with entrepreneurship. Hence the square of age (AGESQ) is expected to be negatively related to entrepreneurship. It is expected that those with more experience in farming (EXPERIENCE) will be more entrepreneurial as they are gaining more confidence through experimentation. After

| Table 1. Entrepreneurship attribute variables. |
|-----------------------------------------------|
| Entrepreneurial attributes | Mean | Std. Dev |
| Weigh chances of succeeding or failing before deciding to do something (WEIGH_CHANCES) | 4.12 | 0.84 |
| Willing to try new ideas even without full knowledge about the possible outcome (NEW_IDEAS) | 4.09 | 0.84 |
| Keen to take advantage of new farm business opportunities (BUSI_OPP) | 3.95 | 0.95 |
| Seek information that helps with tasks (SEEK_INFO) | 2.52 | 1.31 |
| Look for better and profitable ways to run farm operations (PROF_WAYS) | 4.19 | 0.75 |
| Try alternative approaches to address a persistent problem (ALT_APPROACH) | 4.14 | 0.83 |
| Believe it is my responsibility to solve problems that I face (SOLVE_PROB) | 4.22 | 0.72 |
| Deal with problems as they arise rather than spend time to anticipate them (DEAL_PROB_ARISE) | 4.13 | 0.83 |
| Work long and irregular hours to meet demands (LONG_HRS) | 4.14 | 0.94 |
| View the farm as a profit-making business (PROF MAKING) | 3.96 | 1.04 |
| Prefer being my own boss (OWN_BOSS) | 4.40 | 0.82 |
| Know what and when resources are needed and where to get them (KNOW_RESOURCES) | 3.85 | 1.07 |

Source: Survey data (2015; 2016).
accounting for age and disability, household size (HHDSIZE) is used as a proxy for household labour. More labour could enhance on-farm entrepreneurial activities.

WEALTHINDEX is the log-transformed value of all household assets. Farmers with more asset endowment are expected to be more entrepreneurial because it increases self-reliance and the capacity of the household to absorb risk or potential failure. CREDIT is a dummy variable showing access to formal or informal credit (1 = access to credit, 0 = otherwise). Farmers with access to credit are more likely to be in a better position to explore different entrepreneurial opportunities and hence should be more entrepreneurial. LANDSEC is a Likert scale question that shows the extent to which farmers face land tenure security constraints. The higher the score, the more tenure constraints they face. LANDOP is the size of agricultural land operated. Having more land under cultivation is expected to positively affect on-farm entrepreneurial while land security concerns are expected to affect it otherwise. IRRDIST is the amount of time it takes the farmer to walk from homestead to the nearest irrigation scheme. Since most of the farming activities occur in and around the schemes, a longer distance is expected to affect on-farm entrepreneurship negatively.

MEMCOOP is a dummy variable of membership to farmer cooperatives, a form of a social network. Social networks are expected to facilitate interactive learning and play a positive role in enhancing entrepreneurial activities. Likewise, farmers’ experience with extension services (EXTENS), as a source of agricultural information, is also expected to affect on-farm entrepreneurship positively. MEDIA, FELLOWFR and SCHEME are Likert scale variables that show the extent to which smallholder farmers access information from print and electronic media, fellow farmers and scheme management committees, respectively. DIST_TOWN is the amount of time (in minutes) that the farmer would walk to the nearest town. It is a proxy for market access and is expected to be negatively correlated with on-farm entrepreneurship. EARNINC is the proportion of income earned from different economic activities (farming, casual and permanent labour and other small businesses, e.g. selling arts and crafts). This variable is expected to positively affect on-farm entrepreneurship for two reasons i.e. those who earn most of their income are expected to invest more, and if someone is earning most of his/her living, this is expected to promote self-reliance and entrepreneurial spirit. SOCIAL_YRS represents the years that the household has been receiving social grants. A longer period of receiving social grants could be associated with unintended consequences such as the culture of entitlement and expectations which will, in turn, erode self-reliance and entrepreneurial spirit.

5. Empirical estimation results

5.1. Dimensions of on-farm entrepreneurship

The PCA on the entrepreneurial characteristics of the farmers resulted in three factors with eigenvalues greater than 1, explaining 50% of the total variance in the data (Table 3). Although there is no clear rule of thumb, in social sciences where data is not precise and hence is prone to random errors, it is possible and acceptable to consider a solution that explains at least 50% of the total variance (Hair et al., 2014; Peterson, 2000). The Kaiser-Meyer-Okin measure of sampling adequacy (0.89) and the significance of Bartlett’s Test of Sphericity (p < 0.001) demonstrates the appropriateness of the data for factor analysis. The Cronbach’s Alpha for the multi-item index was 0.77, which indicates a high level of internal consistency for the scale (Tavakol and Dennick, 2011), implying that the 12 questions were reliable measures of on-farm entrepreneurship. Only variables with loading of at least 0.4 were interpreted in the results.

Principal components are defined based on the most dominant factor loading/s. The first factor (PC1) has variables with positive loadings on most of the entrepreneurial attributes. It represents smallholder farmers who exhibit a high level of many of the entrepreneurial characteristics. However, it appears their problem-solving skills are weak. Nevertheless, based on the dominance of many other entrepreneurial attributes, the factor was named ‘entrepreneurial’. The second principal component has high factor loadings on three of the 12 variables. The negative high loading on PROF_MAKING shows that farmers represented by PC2 are not profit-oriented and hence farm more for subsistence purposes. However, in their activities, they seek for information and better farming approaches to make their enterprises successful. The loading on BUSI_OPP shows that though the farmers farm for subsistence purposes, they have some entrepreneurial attributes which indicates their propensity to transition to profit-oriented farming. The factor was named ‘subsistence’ based on the most dominant factor loading. The third factor has positive and negative loadings on the variables SEEK_INFO and NEW_IDEAS, respectively. It represents smallholder farmers who are information seeking and cautious in their farming decisions. They are not willing to engage in anything before gathering adequate information on the new venture or idea. The factor was, therefore, named ‘information seeking’. The three principal components formed the outcome variables used in the multivariate regression model, the results of which are presented and explained below.

5.2. Multivariate regression model results

Table 4 reports the results of the multivariate regression analysis. The joint significance of the estimated model was obtained through the multivariate analysis of variance (MANOVA). All the four tests (Wilk’s lambda, Pillai’s trace, Lawley-Hotelling trace and Roy’s largest root) were highly significant (p < 0.001). However, due to the nature of the data (self-assessment scores of entrepreneurial attributes), the study reports Pillai’s trace statistics (F = 2.16) because of its robustness and insensitivity to assumptions on normality. The R-squared values are low as commonly expected in studies that involve cross-section data. The Breusch-Pagan test of independence of residuals of ‘entrepreneurial’, ‘subsistence’ and ‘information seeking’ was insignificant (p = 0.272). This means there was no correlation in the error terms of the three models and hence the models could have been estimated individually and produced almost similar results. Multicollinearity was not a problem because of the low pairwise correlations (<0.5) and an average variance inflation factor of 6.70 which is below the minimum acceptable level of 10. The variable EARNINC_RES contains the predicted residuals.
of the reduced form equation which were included in the joint model to correct for endogeneity. A test for the joint significance of this variable shows a significant test statistic \( F = 3.52; p < 0.015 \), which means the variable was indeed endogenous and there was a need for correction.

5.2.1. Entrepreneurial

The gender of the farmer is positively correlated with being entrepreneurial. Male smallholder farmers tend to be more entrepreneurial compared to their female counterparts. This suggests that gender bias in

| Table 3. Generation of the on-farm entrepreneurial index: the PCA results. |
|-----------------------------------------------|
| **Entrepreneurial attributes** | **PC1** | **PC2** | **PC3** |
| **Risk-taking** | | | |
| WEIGH_CHANCES | 0.667 | 0.384 | 0.027 |
| NEW_IDEAS | 0.429 | 0.086 | -0.435 |
| **Setting opportunities** | | | |
| BUSI_OPP | 0.514 | 0.430 | -0.121 |
| SEEK_INFO | 0.221 | 0.079 | 0.856 |
| **Innovation** | | | |
| PROF_WAYS | 0.601 | -0.175 | 0.047 |
| ALT_APPROACH | 0.616 | 0.497 | 0.003 |
| **Determined and problem-solving** | | | |
| SOLVE_PROB | 0.506 | 0.300 | 0.047 |
| DEAL_PROB_ARISE | 0.624 | -0.097 | 0.125 |
| **Competitive and profit-oriented** | | | |
| LONG_HRS | 0.635 | -0.249 | -0.103 |
| PROF_MAKING | 0.598 | -0.505 | -0.028 |
| **Independent** | | | |
| OWN_BOSS | 0.488 | -0.273 | -0.128 |
| KNOW_RESOURCES | 0.589 | -0.391 | 0.192 |
| Eigenvalues | 3.67 | 1.30 | 1.02 |
| Cumulative % of variance | 30.6 | 41.5 | 50.0 |

**Source:** Survey data (2015; 2016).

| Table 4. Multivariate regression results explaining on-farm entrepreneurship dimensions among smallholder farmers. |
|---------------------------------------------------------------|
| **Independent variables** | **Entrepreneurial** | **Subsistence** | **Information seeking** |
| | Coef. | Std. Err. | P > t | Coef. | Std. Err. | P > t | Coef. | Std. Err. | P > t |
| GENDER | 0.210* | 0.121 | 0.083 | -0.109 | 0.128 | 0.393 | 0.488* | 0.117 | 0.000 |
| AGE | 0.010 | 0.014 | 0.471 | -0.006 | 0.015 | 0.680 | -0.017 | 0.013 | 0.203 |
| AGESQ | 0.019 | 0.029 | 0.502 | 0.021 | 0.031 | 0.491 | 0.036 | 0.028 | 0.200 |
| EDUC | 0.000 | 0.000 | 0.290 | 0.000 | 0.000 | 0.559 | 0.000 | 0.000 | 0.366 |
| EXPERIENCE | 0.005 | 0.005 | 0.311 | -0.003 | 0.006 | 0.565 | -0.004 | 0.005 | 0.438 |
| HHLDSIZE | -0.002 | 0.013 | 0.878 | -0.005 | 0.014 | 0.732 | -0.006 | 0.013 | 0.662 |
| WEALTHINDEX | -0.054 | 0.075 | 0.472 | -0.013 | 0.079 | 0.872 | 0.021 | 0.073 | 0.775 |
| CREDIT | -0.097 | 0.110 | 0.387 | -0.120 | 0.116 | 0.305 | -0.508* | 0.107 | 0.000 |
| LANDSEC | 0.022 | 0.040 | 0.588 | -0.097* | 0.042 | 0.022 | -0.006 | 0.039 | 0.875 |
| LANDOP | 0.147* | 0.222 | 0.508 | -0.405* | 0.234 | 0.084 | 0.251 | 0.215 | 0.245 |
| IRRDIST | 0.001 | 0.002 | 0.430 | 0.005* | 0.002 | 0.004 | 0.001 | 0.002 | 0.563 |
| MEMCOOP | 0.195* | 0.108 | 0.066 | -0.189* | 0.114 | 0.099 | 0.161 | 0.105 | 0.126 |
| EXTENS | 0.121* | 0.047 | 0.010 | 0.046 | 0.050 | 0.354 | -0.046 | 0.046 | 0.311 |
| MEDIA | 0.016 | 0.018 | 0.361 | 0.005 | 0.019 | 0.779 | -0.005 | 0.017 | 0.777 |
| FELLOWFR | -0.026 | 0.057 | 0.645 | 0.030 | 0.060 | 0.621 | 0.058 | 0.055 | 0.292 |
| SCHEME | 0.076* | 0.045 | 0.095 | 0.030 | 0.048 | 0.526 | -0.023 | 0.044 | 0.598 |
| DIST_TOWN | -0.001 | 0.002 | 0.525 | 0.006* | 0.002 | 0.004 | 0.002 | 0.002 | 0.301 |
| EARNED_INC | 0.613* | 0.226 | 0.007 | 0.260 | 0.238 | 0.276 | -0.251 | 0.219 | 0.253 |
| EARNING_RES | -0.661* | 0.235 | 0.005 | -0.244 | 0.248 | 0.325 | 0.342 | 0.228 | 0.135 |
| SOCIAL_YRS | -0.006 | 0.008 | 0.494 | 0.000 | 0.009 | 0.982 | 0.010 | 0.008 | 0.205 |
| Intercept | -0.992 | 0.910 | 0.276 | -0.470 | 0.962 | 0.625 | -1.456 | 0.884 | 0.101 |
| **Joint model** | | | | \( F = 2.16^* \) | | | | | |
| **Corrected model** | | | | \( F = 2.47^* \) | | | | | \( F = 2.92^* \) | | | | \( F = 3.84^* \) |
| R-squared | 0.13 | 0.11 | 0.19 | | | | | | |
| Breusch-Pagan test | Chi2 (3) = 3.900 | p = 0.272 |

**Note:** a, b, c show levels of significance at 1%, 5% and 10%, respectively.

**Source:** Survey data (2015; 2016).
rural communities continues to undermine the growth prospects of the smallholder agricultural sector which is dominated by female farmers. It also means efforts to empower women in farming are yielding little in terms of bridging the gender gap. The findings are consistent with those by Sharaunga et al. (2016) and Chipfupa and Wale (2018a). Consequently, female farmers end up having lower aspirations in farming (Kosec et al., 2012).

Smallholders who are part of an agricultural cooperative exhibit attributes of entrepreneurship compared to non-members. Agricultural cooperatives are forms of structured social networks meant to support farmers with access to input and output markets, bargaining power and information sharing, among other services. The presence of entrepreneurial smallholders in a cooperative could also facilitate interactive learning and influence the behaviour of other farmers thereby promoting on-farm entrepreneurship in the sector. Several studies in the past have reaffirmed the value of social networks in shaping the aspirations and behaviour of farmers (Saint Ville et al., 2016; Abdulai-Rahaman and Abdulai, 2020). The findings also show that irrigation scheme committees are important sources of information that help farmers to be entrepreneurial. Irrigation schemes are the central focus of the South African government’s smallholder agriculture revitalization programme (National Planning Commission, 2011). Hence, the leadership of the schemes has access to information (related to farmer support programmes, production techniques, marketing, financing, etc.) since they are constantly receiving training and advice from government and other agents for onward transmission to their fellow farmers.

Agricultural extension services are critical to promoting entrepreneurship among smallholder farmers. This is supported by Cele and Wale (2020) who concluded that access to extension helps to cultivate a business mindset in smallholder farmers. Sinyolo et al. (2016) also found that access to extension was associated with the utilization of more land. Farmers access extension services such as training, inputs,illage services, production and marketing advice and links to financial services, which assists them in their farming businesses. On-farm entrepreneurship demands financial resources for investment in the transition from subsistent to market-oriented production. A higher proportion of earned income is an indication of the capacity of the household to earn its living and the financial resources available to a farmer which they could use to grow their farm entrepreneurial activities. Alsos et al. (2011) state that entrepreneurial start-up requires financial resources. The lack of finance is a major impediment to entrepreneurship development especially for small to medium scale enterprises (Paulson, 2008). However, Wang et al. (2020) found little evidence linking farm transition to financial capital in rural China. The differences could be contextual given country differences in agricultural policies. Furthermore, having a higher proportion of earned income demonstrates self-reliance and less dependence on handouts, a characteristic common among entrepreneurs (Chipfupa and Wale, 2020).

5.2.3. Information seeking

The results show that gender plays a role in the household’s propensity for information-seeking behaviour. Male farmers are more likely to seek information before making decisions on the farm compared to their female counterparts. Looking for information is costly and time-consuming, yet it is a critical resource in entrepreneurship. Women farmers encounter challenges in accessing agricultural information regarding pricing, markets and financial services, among others (Manfre et al., 2013). This is because women have less access and control over financial markets and resources (Fletcher and Kenney, 2014) and are also constrained in terms of time given their gender-defined family responsibilities (Kidder et al., 2014). This affects their information-seeking behaviour and hence their propensity to be entrepreneurial.

Access to credit is generally considered an important vehicle to the promotion of entrepreneurship (farm or non-farm) (Sinyolo et al., 2016; Nagler and Naudé, 2017). However, the results show that access to credit in this study is negatively associated with information-seeking behaviour. This is because more than 58% of the farmers have access to consumption and not production credit, mainly from informal sources. In times of emergency and when households are short of finance to meet basic needs (such as food, clothing, education, funeral expenses and other emergencies), they often seek desperate gap-filling credit and financial services. The poor and black communities in rural areas are rationed out of the formal credit markets (Okurut, 2006). They mainly depend on the financial services of micro-lenders popularly known as Masimonias and Sokvel or Ungalelo1 (Chipfupa and Wale, 2018a; CSIR, 2005). The problem with such lenders is that, though they are easily accessible, they exploit the lenders (20–30% per month interest) and place the borrowers in emotional and financial distress (over-indebtedness) (Chipfupa and Wale, 2018a). In trying to ‘quickly fix’ immediate household needs, rural households run into a debt spiral2 and end up in financial distress.

5.2.2. Subsistence

Land tenure security is critical to on-farm entrepreneurship development. The lack of land tenure security makes smallholders subsistent-oriented. This is because of the risks that are associated with making long-term decisions on an insecure piece of land. Some smallholders in the schemes are leasing land from other farmers or the Ingonyama Trust (a trust of traditional leaders). It is in the context of these contractual arrangements that land security challenges emanate. The major challenge is the absence of control that one has on the leased land and non-compliance to the contractual agreement, especially by the lessor. The problems are made worse by the fact that recourse in these arrangements is difficult to get since the relationship is based on trust and such land transactions are considered illegal. Similar results have been reported in Chipfupa and Wale (2018a).

Operating a large piece of land does not necessarily make a farmer entrepreneurial. In the study, utilizing more land is associated with being subsistent-oriented. The average landholding is higher among rainfed farmers (3.02 ha) compared to irrigation farmers (1.30 ha). However, rainfed farmers constantly face other challenges such as drought that render operations on the land of no effect. This is testimony to the fact that having land without access to other resources (inputs, water, market access and other services) does not motivate farmers to engage in on-farm entrepreneurship. On-farm entrepreneurship is also associated with access to markets. Being closer to the nearest town, where the markets for farm produce are found, make farmers less subsistent and more profit-oriented. This promotes entrepreneurial behaviour among farmers because of the enhanced opportunity to earn higher income for their produce. Other studies have found similar results (Sinyolo et al., 2016; Van der Heijden and Vink, 2013), demonstrating the importance of access to markets in the transformation of the smallholder sector.

Smallholders who stay far away from the nearest irrigation scheme tend to be more subsistent. The closer one is to the schemes the more they are likely to be in irrigation and vice versa. Besides available water resources, irrigation schemes offer several other targeted support services that enhance entrepreneurship for those in irrigation. The support includes access to information, training, agricultural inputs, infrastructure, agricultural technology and collective marketing (Cele and Wale, 2020; Muchara et al., 2014). The finding regarding membership to a cooperative concurs with the results regarding the same variable under the ‘entrepreneurial’ model. Non-membership to an agricultural cooperative is associated with subsistence-oriented farmers. This further demonstrates the role of cooperatives and other collective action organisations in promoting entrepreneurial behaviour among smallholder farmers.

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1 Masimonias is a Zulu word referring to a person who depletes or drains someone’s financial resources through exorbitant interest rates, often forcing repayment (Mashigo, 2012). Sokvel or Ungalelo is a loan given to an individual by an informal savings group (CSIR, 2005).

2 Debt spiral or over-indebtedness means using loans to pay off other loans.
that poor households often resort to such sources of finance. Such households spend most of these funds on basic needs and less on production, wealth creation and investments. This means the credit commonly available to rural farmers does not contribute much to their on-farm entrepreneurship decisions.

6. Conclusions and implications for policy

Entrepreneurship is one of the common strategies and pillars for the transition from subsistence to commercial production in smallholder agriculture. However, this demands a better understanding of the factors that inhibit or enable entrepreneurial behaviour among small-scale farmers. This study has found that access to extension and information from scheme committees, access to markets, being a male farmer, achieving higher earned income and membership to collective action groups are the enablers. On the other hand, the inhibitors include land tenure insecurity, access to land without the necessary complementary inputs/resources, consumption credit and staying far away from irrigation schemes.

Gender bias in rural communities, which is still strongly aligned to culturally defined roles and power relations, impede on-farm entrepreneurship among women farmers. Reducing the gender differences especially in terms of access to resources (including information) and decision making will enhance entrepreneurial behaviour in rural communities. Platforms for sharing of farming and marketing information, ideas and experiences, and also for collective action are vital to the development of positive entrepreneurial behaviour. There is a need to identify opportunities for developing and nurturing such avenues in the rural communities including the utilization of the existing cooperatives and irrigation schemes as information centres.

Three forms of institutional support are critical for the growth of on-farm entrepreneurship among smallholder farmers, i.e., demand-driven agricultural extension services, market linkages and access to finance. To be effective, the services should be relevant to the needs and situations of the smallholders. The provision of financial services (such as credit) to support the transformation agenda should always be qualified. Whereas production credit will positively impact on-farm entrepreneurship, consumption credit can be retrogressive to any efforts meant to promote entrepreneurship in the sector. Credit which is directly linked to agricultural production (e.g. input vouchers and value chain financing) will prompt farmers to seek information that will improve their performance. Informal micro-credit service providers in rural areas must be better regulated to make them contribute to the entrepreneurial development of smallholder farmers.

The provision of land without access to other complementary resources will not promote on-farm entrepreneurship. Hence, the parceling of land whether through the establishment of new irrigation schemes or under the land redistribution programme, should make provisions for availing other key resources. Furthermore, there is a need to improve the land tenure security in the sector through the establishment of appropriate and clear mechanisms for leasing under-utilized land, especially in the schemes. Moving forward, further research could examine the theory and practice of entrepreneurship in smallholder agriculture including the psychological foundations of farmers’ entrepreneurial mindsets.

Declarations

Author contribution statement

Edilegnaw Wale: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Unity Chipfupa, Nolwazi Hadebe: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

The project final report is available at www.wrc.org.za ‘WRC Report No. 2278/1/18’.

Competing interest statement

The authors declare no conflict of interest.

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