

Towards an agricultural entrepreneurship development model: an empirical investigation in Namibia's agricultural communities

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Abstract

Purpose –Entrepreneurship is increasingly being recognised as a vehicle for bringing about the development of different economic sectors in various geographical regions, and it is believed to result in greater productivity and entrepreneurial performance in agriculture. To date, there are no empirically verified holistic models focussing on the development of agricultural entrepreneurship in an African context. This study aims to fill this gap by developing an agricultural entrepreneurial development model (AEDM) that provides a basis for enhancing entrepreneurial performance in the agriculture sector.

Design/methodology/approach –First, a holistic conceptual AEDM was built from the extant literature with a focus on the African context and encompassing dimension of the enabling environment, entrepreneurial performance and its outcomes. Then, the model was tested empirically by conducting a survey with 477 farmers in Namibia who benefit from Namibia's National Resettlement Programme and the Affirmative Action Loan Scheme. The model was tested statistically using partial least square-structural equation modelling.

Findings –The results reveal that a supportive environment, entrepreneurial orientation and agricultural sustainability exert a positive impact on entrepreneurial performance in agriculture, which, in turn, leads to greater agricultural productivity and increased income for farmers.

Originality/value –The study theoretically develops and empirically tests a holistic model of agricultural entrepreneurship development. The value of the model lies in its consideration of a plethora of enabling-environment antecedents of entrepreneurial performance in agriculture, as well as some specific organisational- and individual-level outcomes thereof. Therefore, it offers policymakers and practitioners a blueprint for developing agricultural entrepreneurship in an African context.

Keywords Entrepreneurial orientation, Entrepreneurial performance, Agricultural entrepreneurship, Agricultural sustainability, Development model, Supportive environment

1 Introduction

Entrepreneurship is recognised as a significant conduit for bringing about transformation to sustainable products and processes, with several scholars (e.g., Acs *et al.*, 2008; Horne *et al.*, 2020; Santos, 2012) advocating entrepreneurship as a possible solution for many social and environmental concerns. One such concern is the status of the agricultural sector worldwide, which is crucial to the livelihoods of many people (FAO, 2020) and a vital tool for eradicating poverty and hunger (Gil *et al.*, 2019). The application of entrepreneurial principles and practices to this sector is deemed crucial to its vitality (Fitz-Koch *et al.*, 2018) and lies at the foundation of the scholarly field of agricultural entrepreneurship, which may be understood simply as the development of new agricultural ventures (Pintado & Sánchez, 2017:422) for income generation (Seuneke *et al.*, 2013:208). Similarly, Ahmadi and Seymourii (2008:9) define agricultural entrepreneurship as the generation of value through the creation or expansion of agricultural activity, by identifying and exploiting new products, processes, and markets.

Accordingly, agricultural entrepreneurship is a concept that has gained attention from scholars in the last decades (Adobor, 2020; Fitz-Koch *et al.*, 2018; Palmås & Lindberg, 2013). However, research on agricultural entrepreneurship is still fairly limited. Recent systematic literature reviews (e.g., Dias *et al.*, 2019a; Fitz-Koch *et al.*, 2018) highlight how entrepreneurship research has largely overlooked the agricultural sector compared to other sector-contexts, even though there has been a definite rise in research on agricultural entrepreneurship more recently (Dias *et al.*, 2019b).

The prevalence of undernourishment in sub-Saharan Africa appears to have risen from 17.6 to 19.1% between 2014 and 2019, indicating that a large proportion of the population (250.3 million people) in the region is experiencing severe food insecurity (FAO, ECA & AUC, 2021). As a result, a greater proportion of the population in this region depends on agriculture for their livelihood (Woldemichael *et al.*, 2017). Agriculture is particularly important for sub-Saharan Africa, which occupies close to half of the potentially available land for rain-fed cultivation in the continent (Dethier & Effenberger, 2012).

Research on agricultural entrepreneurship in the African context is also still relatively scarce (Adobor, 2020; Dias *et al.*, 2019a, 2019b; Fitz-Koch *et al.*, 2018) compared to other geographical contexts. This constitutes a relevant first research gap. Given that the

entrepreneurship discipline is contextual and that its theoretical advances also come from novel contextual applications (Fitz-Koch *et al.*, 2018; George *et al.*, 2016), agricultural entrepreneurship enquiry in the African context may be regarded as a promising avenue for advancing this field theoretically. This argument is even more compelling if we consider that the agriculture sector in Africa exhibits its own contextual peculiarities, such as the nature of agricultural practices—also influenced by available technology and climatic conditions—and the economic and institutional climate (Zhou *et al.*, 2013).

Moreover, as will be illustrated in this paper's literature review section, agricultural entrepreneurship research in the African context is not only scarce but also scattered, with studies making specific contributions to the field depending on their research objective and theoretical lens. Consequently, there appears to have been no empirical effort at building and testing a holistic model of agricultural entrepreneurship development for the African context. This is a noteworthy second research gap: notwithstanding the relevance of agricultural entrepreneurship in this context, empirical research has yet to offer a holistic view of how agricultural entrepreneurship may be fostered (i.e., antecedents) and what outcomes may ensue for both farmers and their activities (Fitz-Koch *et al.*, 2018). Hence, the continent lacks a reliable model to enable deliberate policy-making efforts to bring about sustainability in agricultural entrepreneurship (Zhou *et al.*, 2013).

In light of the aforementioned gaps in agricultural entrepreneurship research, this paper develops an agricultural entrepreneurship development model (AEDM) indicating which enabling environment dimensions lead to entrepreneurial performance in agriculture and which entrepreneurial outcomes result from entrepreneurially oriented agricultural practices. We first develop the AEDM conceptually based on extant research on agricultural entrepreneurship, entrepreneurship development and agricultural sustainability. The conceptual model encompasses the following domains: the enabling environment, entrepreneurial performance and entrepreneurial outcomes. Then, we proceed to test the model empirically by conducting a quantitative survey with 477 farmers in Namibia and analysing the data through structural equation modelling (SEM).

The study benefits research and practice mainly in two ways. Firstly, it adds to the existing body of knowledge in the field of entrepreneurship, considering the limited scholarly research on the role of entrepreneurship in agriculture in the African context. Secondly, the study

enlightens policymakers about the potentially critical role of entrepreneurship in agriculture, in general, and the significance of certain enabling-environment dimensions, in particular, to formulate agriculture and land reform policies that can lead to improved entrepreneurial performance. The study also offers empirical evidence on whether entrepreneurial performance in agriculture contributes, in turn, to certain entrepreneurial outcomes, thereby supporting the importance of agricultural entrepreneurship in the context of investigation. The ensuing literature review section reviews the literature on agricultural entrepreneurship in an African context and develops a conceptual AEDM for this context.

2 Literature review

2.1 Agricultural entrepreneurship research in Africa

Agricultural entrepreneurship as a field of scholarly enquiry and practice represents the meeting point between entrepreneurship as a discipline and agriculture as an economic sector. There have been calls to study agricultural activities under the entrepreneurship lens (Fitz-Koch *et al.*, 2018), given that farmers may be regarded as entrepreneurs under some respects (Dias *et al.*, 2019b). Agricultural entrepreneurship—also called “farm entrepreneurship”, “agri-entrepreneurship/agripreneurship” or “agro-entrepreneurship/agropreneurship” (Dias *et al.*, 2019b)—is quintessentially the application of entrepreneurship principles to the running of an agricultural activity. The growing interest in this field may be ascribed to the importance of agriculture as a sector for the global economy, representing 4% of global GDP and employing 27% of the global workforce (FAO, 2020). There has been a concomitant consensus regarding entrepreneurship as the “emergence of new economic activity”, which views entrepreneurship as a force for creating a better socioeconomic world (Wiklund *et al.*, 2011). Entrepreneurial activity and the entrepreneurial venture are influenced by the socioeconomic environment and may ultimately result in economic growth and human welfare (Carlsson *et al.*, 2013).

Notwithstanding this growing interest in the agriculture sector from entrepreneurship scholars, one still largely neglected context is Africa. As can be seen from recent systematic reviews of agricultural entrepreneurship literature spanning the last five decades (Dias *et al.*, 2019a, 2019b), very little research has been conducted on agricultural entrepreneurship in an African context. This is despite the fact that the agricultural sector’s contribution to GDP keeps growing in this continent, accompanied by rising agricultural employment rates (FAO, 2020). While agricultural entrepreneurship represents the extension of the field of entrepreneurship to the agriculture sector-context (Fitz-Koch *et al.*, 2018), the geographical coverage of this

interdisciplinary field is still limited and, to a large extent, does not represent the African region. Moreover, the few studies falling under this umbrella have pursued disparate research objectives and followed different methodological approaches. While not aiming to cover all the studies on agricultural entrepreneurship contextualised to Africa (this would go beyond the empirical scope of this paper), we hereby briefly present a few cases in point. Given the modelling focus of this paper, we shall dwell especially on studies investigating the drivers and outcomes of agricultural entrepreneurship amongst African farmers.

To our dismay, the number of studies falling into the above category is very limited. One of the first studies in this research stream is Dorsey's (1999) investigation of the role played by agricultural intensification, diversification, and commercial production on farmers' income in Kenya. The findings of this study reveal that higher risk-taking in the form of crop diversification and specialisation is associated with higher income, irrespective of farm size. A later study by Ras and Vermeulen (2009) investigated the influence of a limited number of factors on the profitability and environmental performance of wine farms in South Africa. In this study, innovativeness, responsiveness and business networking exerted a positive influence on environmental performance, while adequate management and market timing enhanced profitability. The study by Salau *et al.* (2017) surveyed farmers in Nigeria and focussed on their entrepreneurial skills, identifying the number of extension visits, farm size and training as factors leading to the development of entrepreneurial skills among farmers. Mupfasoni *et al.*' (2018) investigation comes close to this paper's research objective with by studying the drivers and outcomes of sustainable agricultural entrepreneurship in Burundi. Unfortunately, however, the outcome-variable domain in this study was represented by some sustainability aspects as reflected in farmers' business plans, as opposed to realised performance outcomes. Moreover, no inferential statistics were conducted, but only group comparisons of mean scores across the study's constructs, which included entrepreneurial orientation, prior knowledge and income motivation.

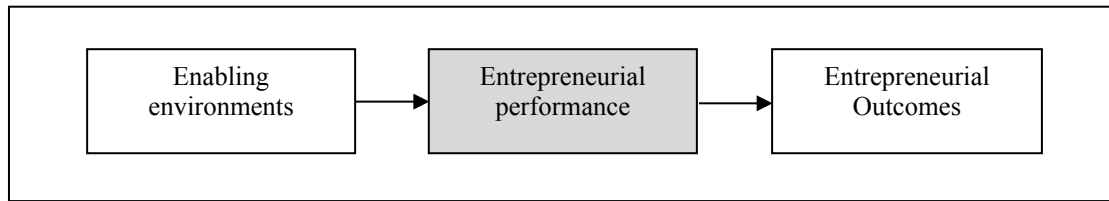
More recent studies in South Africa have examined agricultural entrepreneurship more holistically with empirical investigations spanning several dimensions. For instance, Wale and Chipfupa (2021) studied subsistence (smallholder) farmers and the factors inhibiting the realisation of entrepreneurship in their agricultural practices. While following an approach opposed to the one followed on this paper (which focusses on the drivers or enabling factors, and not hindering factors), their findings are worth reporting. Wale and Chipfupa (2021) found

that smallholder farmers exhibit the following characteristics hindering an entrepreneurial approach in farming: they farm for subsistence and not to maximise profit, rely significantly on unearned income, have low risk-taking propensity, have external locus of control, and do not possess a business mindset. The authors recommend the application of a psychological capital lens in agricultural entrepreneurship research as complementary to an enabling institutional environment lens. In another study, Wale *et al.* (2021) take up this challenge and conduct a comprehensive analysis of the attributes associated with farmers' entrepreneurial psychological capital endowment. Their study uncovers the following positive factors: gender (being a male), belonging to an agricultural cooperative, access to input and output markets, access to extension services and higher earned income. The authors conclude by suggesting that an enabling institutional environment for agricultural entrepreneurship should include demand-driven agricultural extension services, market linkages and access to finance.

Other studies were not considered in this literature review either because they focussed on narrower research topics such as the efficacy of specific entrepreneurship programmes (Adeyanju *et al.*, 2021), diversification and risk management (Little *et al.*, 2001), specific pedagogies to foster innovation (Zossou *et al.*, 2009), the impact of cell phones on social network dynamics (Mehta *et al.*, 2011), the impact of social-grant dependency (Sinyolo *et al.*, 2017) or the role of micro-franchise for the development of agricultural entrepreneurship (Diochon *et al.*, 2017; Nukpezah & Blankson, 2017).

What emerges from the literature is that a study of the mechanisms fostering agricultural entrepreneurship in an African context and of its concomitant outcomes for farming practices is still missing. While Wale *et al.* (2021) took a holistic approach in the investigation of farmers' psychological capital, which the authors posit to be complementary to an enabling environment, it is precisely the lack of a holistic view of what may constitute this enabling environment that this paper seeks to address. This gap hinders the understanding of how agricultural entrepreneurship can be stimulated amongst farmers in Africa and what impact it creates for them. Hence, the present paper undertakes to develop and test an agricultural entrepreneurship development model (AEDM) spanning both the enabling environment and the outcomes of entrepreneurial performance in agriculture. Given the lack of an existing model focussed on agricultural entrepreneurship, our model development effort had to search for salient dimension relating to both the entrepreneurship and agriculture domains.

Figure 1: Basic conceptual framework of agricultural entrepreneurial development



To inform the conceptualisation of the AEDM, a basic conceptual framework is first presented. Figure 1 below provides a basic depiction of the domains contained in the model and their relationship.

[Insert Figure 1 about here]

The proposed framework proceeds from the premise that an enabling environment should create the necessary conditions for farmers' entrepreneurial performance. This latter domain represents the focal point in the model, in line with previous studies (Dias *et al.*, 2019b; Fitz-Koch *et al.*, 2018), as the key outcome of an agricultural entrepreneurship enabling environment. Entrepreneurial performance, in turn, would lead to further entrepreneurial outcomes in an agricultural context. The rest of the literature review builds the AEDM by identifying key constructs under each domain in Figure 1.

2.2 *Enabling environment for agricultural entrepreneurship*

The consideration of which enabling environment elements may lead to an improved entrepreneurial performance in agriculture should consider both agriculture- and entrepreneurship-related aspects, which we address in turn.

2.2.1 *Agricultural sustainability*

Like other sustainability concepts, defining agricultural sustainability is a difficult task (Lampridi *et al.*, 2019) as there is no universally accepted definition for the concept (Van Pham & Smith, 2014). Taking a landscape ecological perspective, Dale *et al.* (2013:1112) define agricultural sustainability as involving practices that are environmentally sound, economically profitable, and socially just. This means that agriculture should be able to provide food for today's population without putting at risk the provision of the same services in the future. This exposition is supported by Gómez-Limón and Sanchez-Fernandez (2010), who point to the multidimensional character of the concept of sustainable development in terms of economics, social justice, and environmental friendliness.

Some authors (e.g., Chang, 2009; Salau *et al.*, 2017; Suman *et al.*, 2014; Wale *et al.*, 2021) advocate for the inclusion of extension services in agriculture, commonly understood as advisory services (Labarthe & Laurent, 2013). Climate change has also been recognised to impact agricultural sustainability significantly (Koyenikan & Anozie, 2017; Zhou *et al.*, 2013),

with farmers having to make the necessary adaptations to maintain their food production levels. Similarly, some authors (Dale *et al.*, 2013; Nkambule & Dlamini, 2012; Suman *et al.*, 2014) highlighted the importance of conserving natural resources and the ecosystem, preserving biodiversity, and preventing soil erosion and degradation to enhance sustainable agriculture.

Based on the above considerations, in this study, we consider agricultural sustainability as constituted by climate change; extension services; and ecosystem, biodiversity, and soil erosion. This led to the formulation of Hypothesis 1.

H1: Agricultural sustainability positively influences entrepreneurial performance.

2.2.2 *Supportive and cooperative environment*

A supportive environment is critical to the promotion of entrepreneurship. Various scholars (Carlsson *et al.*, 2013; Dvouletý & Orel, 2020; Nieman & Nieuwenhuizen, 2014) support such an assertion. They refer to the overall macroeconomic, sociocultural, and political variables in the external environment—including deregulation, the legal framework, property rights, social capital, public services, infrastructures, and tertiary institutions—influencing entrepreneurship development (Nieman & Nieuwenhuizen, 2014). Therefore, the socioeconomic environment—encompassing the availability of finance, economic and social policies, the presence of industry clusters, and geographical parameters—may influence entrepreneurial activities (Carlsson *et al.*, 2013).

A supportive environment for entrepreneurship development may be constituted by the following dimensions: the regulatory framework, financial support, non-financial support, culture, social capital, role models, education and training, and market conditions (Carlsson *et al.*, 2013; Nieman & Nieuwenhuizen, 2014; Suman *et al.*, 2014). In the more specific context of agricultural entrepreneurship, government support and conducive policies play a vital role in the development of entrepreneurial activity in the agriculture sector (Gholamrezai *et al.*, 2021; Rajaei *et al.*, 2011; Tash *et al.*, 2018). There is also evidence that financial support, access to finance, tax breaks and financial reforms aid agricultural entrepreneurial practice (Nukpezah & Blankson, 2017; Rajaei *et al.*, 2011; Wale *et al.*, 2021). Additionally, non-financial support such as access to markets (e.g., through a cooperative) is conducive to agricultural entrepreneurship (Wale *et al.*, 2021). Farmers connected to other entrepreneurs are more likely to become entrepreneurs in turn (Arafat *et al.*, 2020; Wale *et al.*, 2021), as well as when they receive entrepreneurship education and training (Adeyanju *et al.*, 2021;

Mohammadinezhad & Sharifzadeh, 2017). Finally, for farmers who commercialise their operations, conducive market conditions are key success factors (Dorsey, 1999; Ras & Vermeulen, 2009).

In this study, we adopt Nieman and Nieuwenhuizen's (2014) conceptualisation of the supportive environment to include a cooperative environment. Thus, we consider the supporting environment to include the regulatory framework, non-financial support, social capital, and role models—and the cooperative environment to include culture, education and training, financial support, and market conditions. This exposition led to the formulation of the following hypotheses:

H2: The supportive environment positively influences entrepreneurial performance.

H3: The cooperative environment positively influences entrepreneurial performance.

2.2.3 *Entrepreneurial orientation*

One of the key constructs traditionally related with firm performance is entrepreneurial orientation (Lumpkin & Dess, 1996; Wiklund & Shepherd, 2005). Hence, this is a salient dimension to be included in the AEDM given that entrepreneurial performance is at the core of the model.

Entrepreneurial orientation is construct indicating how innovative, risk-taking and proactive firms are in their behaviour and management philosophies, and these dimensions are also applicable to individuals (Anderson *et al.*, 2015). The original entrepreneurial orientation construct developed by Miller (1983) precisely encompassed these three dimensions (innovativeness, risk-taking and proactiveness). Later, Lumpkin and Dess (1996) extended this framework to also include autonomy and competitive aggressiveness. Nonetheless, Miller's (1983, 2011) three-dimensional conceptualisation of entrepreneurial orientation remains the most common in research (Anderson *et al.*, 2015). This is evinced also in agricultural entrepreneurship research, with most studies using the entrepreneurial orientation lens considering the three dimensions of innovativeness, risk-taking and proactiveness and confirming the positive influence of entrepreneurial orientation on organisational performance (Dias *et al.*, 2019b).

In the African context, however, empirical investigations encompassing entrepreneurial orientation have been either partial or not rigorous. For instance, Ras and Vermuelen (2009)

only included the innovativeness dimension in their study, which revealed that innovativeness exerts a positive influence on wine farmers' environmental performance. Conversely, the study by Mupfasoni *et al.* (2018) considered all three dimensions but was limited to descriptive statistics, finding that farmers score higher on proactiveness than on innovativeness and risk-taking.

In the last analysis, this paper adopts the three-dimensional conceptualisation of entrepreneurial orientation, comprising innovation, risk-taking and proactiveness. Hypothesis 4 was formulated as follows:

H4: Entrepreneurial orientation positively influences entrepreneurial performance.

2.2.4 *Entrepreneurial competencies*

According to Santos *et al.* (2019), entrepreneurial competencies enable an individual or a team to successfully perform an entrepreneurial task. Entrepreneurial competencies—considered as critical drivers of entrepreneurial performance—can only be realised in an environment fostering entrepreneurship. Wang *et al.* (2019) note that in defining entrepreneurial competencies, three domains—skills, knowledge, and attitudes—must be considered. Botha *et al.* (2019) also add perseverance, networking, value creation, and self-efficacy to the list. Antonites (2003) regards skills development in an entrepreneurial context as entailing the development of entrepreneurial skills (such as risk propensity, creativity and innovation, opportunity identification, and role models), performance motivation, and business skills (such as general management, marketing, legal, operations, human resource management, business management, and financial management skills). These skills can be further classified into three major categories: entrepreneurial, leadership, and management skills (Sousa, 2018).

Notwithstanding the above, Morris *et al.* (2013) contend that whilst business skills are important, they do not adequately address the unique requirements of the entrepreneurial context. As a result, these scholars advocate for the development of a unique set of competencies that adequately address the unique requirements of the entrepreneurial context. Entrepreneurial skills are important in a rural context where entrepreneurs interact with the institutional regulatory environment and the economic market environment and need to understand these complex environments. In this regard, Deakins *et al.* (2016) suggest a conceptual framework that would aid the development of entrepreneurial competencies to manage such complex and important environments and achieve entrepreneurial performance.

Given the various approaches and categorisations of entrepreneurial competencies outlined above, we opted for Antonites' (2003) entrepreneurship training model, which originated from an empirical investigation in the South African context and is, thus, more attuned to the present context of investigation. Under this model, entrepreneurial competencies are constituted by entrepreneurial skills, business skills, technical skills, performance motivation, and mentorship. Hence, Hypothesis 5 was formulated as follows:

H5: Entrepreneurial competencies positively influence entrepreneurial performance.

2.3 Entrepreneurial performance in agriculture

The AEDM put forward by this study is centred around entrepreneurial performance in agriculture. The success of any business is determined by its general performance (Purnomo, 2019). Entrepreneurial performance is regarded as a function of various factors, including performance motivation, entrepreneurial skills, business skills (Antonites, 2003), entrepreneurial capital, knowledge, and capacity (Sebikari, 2019). According to Lucky (2011), performance is a measurement or indicator for the evaluation or assessment of individuals, groups, firms, and organisations. The author advocates for the classification of business performance into firm/organisational performance and owner/entrepreneur performance. In this study, we shall focus on the entrepreneurial performance of farming operations, thus focussing on entrepreneurial performance at an organisational level.

Various measures are employed to assess performance either at an individual or firm level, and this may include financial and non-financial measures. Sebikari (2019) asserts that entrepreneurial capital, knowledge and capacity have a positive relationship with entrepreneurial performance. Entrepreneurial performance can be defined in financial or non-financial terms. In this regard, Purnomo (2019) posits that financial performance is the financial objective of any business, while non-financial performance represents the firms' operational efficiency. Financial indicators or measures of performance include sales growth, return on investment, return on assets and return on sales (Purnomo, 2019; Zainol & Al Mamun, 2018), while non-financial indicators may include productivity, satisfaction, global success ratings, competitive strength and managerial experience (Zainol & Al Mamun, 2018).

Considering the above performance dimensions in light of this study's population made up of small-scale farmers, we operationalised the construct of entrepreneurial performance as

comprising the following non-financial performance dimensions: growth in agricultural business, competitiveness, and agricultural start-ups. In making this choice, we mainly considered the performance dimensions that respondents would more confidently understand and provide information about and the fact that their farming operations are mostly informal, which would make it difficult to collect financial metrics.

2.4 Outcomes of entrepreneurial performance

As for entrepreneurial outcomes arising from the entrepreneurial performance of farming operations, the literature is particularly scant. The systematic review by Fitz-Koch *et al.* (2018) indicates that studies covering the outcomes of entrepreneurship in the agriculture sector at the individual and organisational levels of analysis are only twenty-one in total, and already include the performance dimensions identified above. Hence, the number of studies on the outcomes of entrepreneurial performance in agriculture is even more limited. Nevertheless, the extant literature points to a few specific entrepreneurial outcomes. In this final section of the AEDM, we not only include organisational-level dimensions (as for entrepreneurial performance) but also individual entrepreneurial measures such as self-employment income (Shane & Nicolaou, 2013). Particularly, we consider how entrepreneurial performance in agriculture may give rise to entrepreneurial outcomes such as growth, income generation, and improved living standards (Cumming & Fischer, 2012), which represent both organisational and individual entrepreneurial performance dimensions. We deem that such a parsimonious choice of entrepreneurial outcomes is appropriate considering the study's sample.

More specifically, one of the possible entrepreneurial outcomes of improved organisational performance in agriculture is increased productivity (Diochon *et al.*, 2017), which has been studied in the African context in conjunction with crop intensification, diversification and commercialisation (Dorsey, 1999), as well as with the level of entrepreneurial activity in a country (Kriese *et al.*, 2021). Higher levels of productivity may lead in turn to higher profitability and income. In fact, given that farmers may be considered as entrepreneurs in their own right, some studies have investigated the impact of agricultural entrepreneurship on African farmers' income (Adeyanju *et al.*, 2021; Dorsey, 1999) and farming operations' profitability (Ras & Vermeulen, 2009). Finally, since higher income levels are likely to lead to improved livelihoods, and considering the rural contexts in which agricultural entrepreneurship takes place, especially in developing countries, scholars have also studied the impact of

agricultural entrepreneurial activities on farmers' livelihoods (Mumuni & Oladele, 2016; Mwaura, 2017).

Based on the above considerations, we formulated the following hypotheses:

H6: Entrepreneurial performance positively influences agricultural productivity.

H7: Entrepreneurial performance positively influences incomes.

H8: Entrepreneurial performance positively influences livelihoods.

[Insert Figure 2 about here]

The conceptual AEDM resulting from the above literature review is presented in Figure 2. According to the model, the enabling environment—composed of the supportive and cooperative environments, entrepreneurial orientation, entrepreneurial competencies and agricultural sustainability—enhances the entrepreneurial performance of agricultural activities, which then lead to the entrepreneurial outcomes of agricultural productivity, increased incomes and improved livelihoods. The rest of the paper focusses on testing the AEDM empirically.

3 Methodology

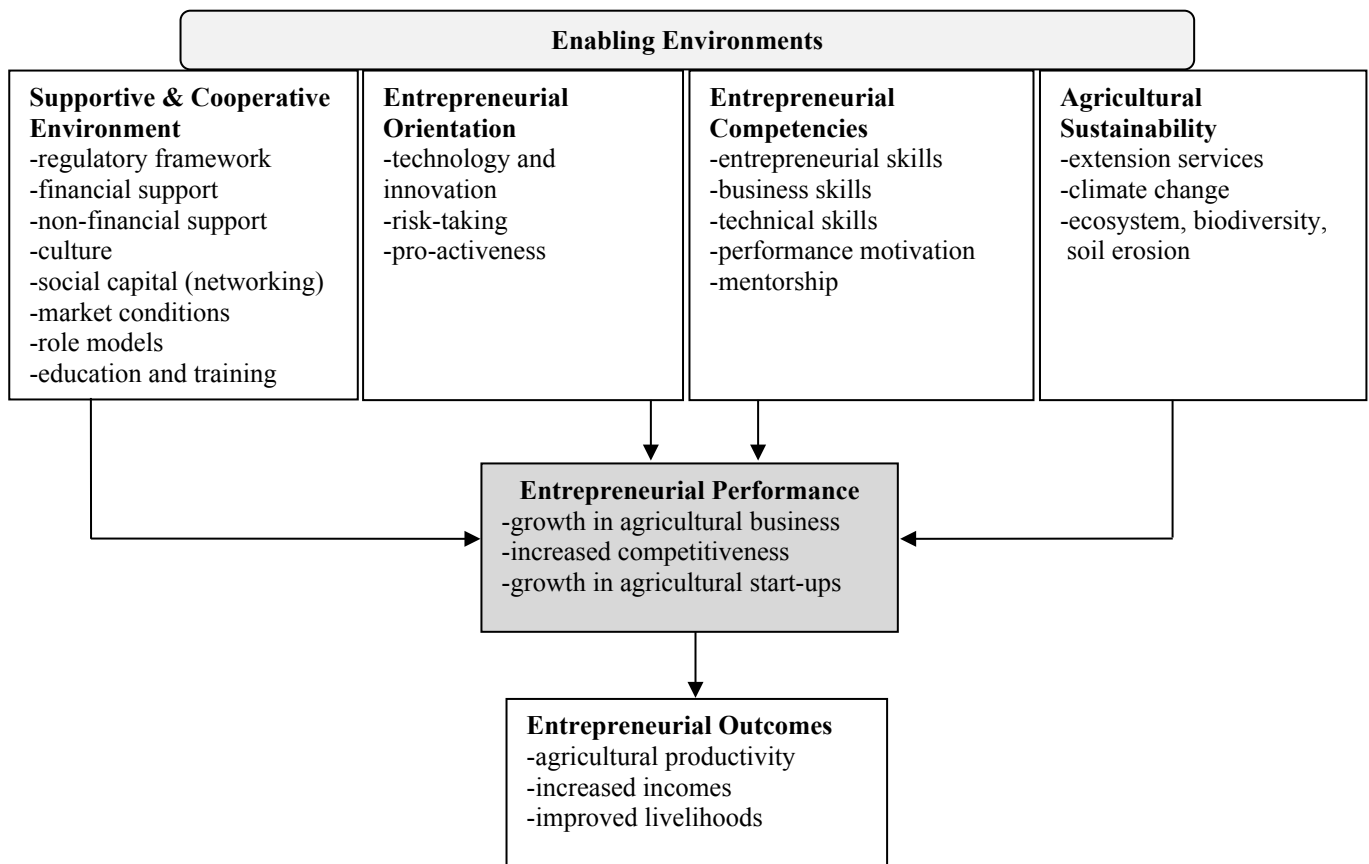
The study adopted a quantitative research approach in its design. SEM, specifically Partial Least Square SEM (PLS-SEM), was used to test the model presented in Figure 2. The dependent variables are entrepreneurial performance, agricultural productivity, increased incomes, and improved livelihoods. The independent variables include the supportive environment, cooperative environment, entrepreneurial orientation, agricultural sustainability, and entrepreneurial competencies.

3.1 Sampling

The population of this study is represented by farmers in Namibia. Even though the aim of this paper is to develop and test an AEDM for the African context, the context of investigation and, thus, the population had to be circumscribed to a narrower geographical scope, as is often the case in empirical research where the theoretical population is not accessible.

To draw a sample from this population, purposive sampling was employed. This was necessary due to the lack of a comprehensive existing database of farmers in Namibia and the often rural and informal nature of their farming activities, which makes farmers hard to reach and select

Figure 2: Conceptual model of agricultural entrepreneurial development



using probability sampling techniques. Hence, we relied on existing lists of farmers that, while not exhaustive, are large enough to be considered comprehensive. Purposive sampling also facilitated the administration of hard-copy questionnaires considering reasons of cost, time, and the availability of respondents near the study's principal location, Windhoek.

A sample of the target population was drawn from farmers benefitting from Namibia's National Resettlement Programme (NRP) and the Affirmative Action Loan Scheme (AALS). This sample was obtained from the records of Namibia's Ministry of Lands and Resettlement for NRP farmers, and the records of Agribank for AALS farmers. These two categories of farmers, targeted by the land reform programme, form the focus of this study. The qualifying criteria used for inclusion in both the NRP and AALS programmes include the following: an applicant must (i) be a Namibian citizen, (ii) be at least eighteen years of age, (iii) have no more than 150 large stock or 800 small stock, and (iv) not own any land, other than for residential purposes. Additionally, preference is given to applicants with a background in agriculture (farming or education), women applicants, applicants who are generational farm workers (those who and whose parents have worked on farms for years), applicants from communal farming areas, and applicants with basic reading and writing skills (Ministry of Lands and Resettlement, 1998). After data-cleaning procedures, the study included 477 valid responses from this sample.

3.2 *Data collection instrument*

The research instrument, used to gather data for this study, was a structured questionnaire. Items that could best describe the constructs were identified from the literature review and pooled to form a 5-point Likert-type questionnaire.

Entrepreneurial performance was measured by 11 items adopted from Murphy *et al.* (1996) for the growth construct and from Man *et al.* (2002) for the competitiveness construct. A total of 9 items measured the construct of entrepreneurial outcomes, derived from Yusuf (2010), which focussed on indicators of agricultural productivity, increased incomes, and improved livelihoods. Agricultural sustainability was measured by 11 items borrowed from Rigby *et al.* (2001). The supportive environment and cooperative environment were measured by 15 and 12 items, respectively, adapted from Manolova *et al.*'s (2008) measurement scale of a country's regulatory, cognitive and normative institutional pillars for the promotion of entrepreneurship. Entrepreneurial orientation (EO) was measured by 7 items, taken from Covin and Slevin (1989)

and Miller and Friesen (1982). Finally, a total of 22 items measured entrepreneurial competencies, mainly adapted from Antonites (2003) and St-Jean and Audet (2012) and capturing the dimensions of entrepreneurial skills, business skills, technical skills, performance motivation, and mentorship.

3.3 *Model testing*

To empirically test and validate the AEDM, out of the conceptual model we developed measurement and structural models drawing on the approaches found in the literature (Coltman *et al.*, 2008; MacKenzie *et al.*, 2005). The component constructs of the AEDM are measured by the indicators within each construct, constituting a measurement model of each. The structural model for this study is represented by the relationships between constructs, and PLS-SEM was used to test the model.

4 **Results**

4.1 *Descriptive statistical analysis*

The present section describes the sample in detail. This is to allow for a better understanding of the context of investigation and to guide the generalisation of this study's findings to other contexts. The majority (77.5%) of those involved in farming were in their middle to senior age group (40 to 60 age range). The number of participants who fell into the age range 18 to 28 was quite negligible at 0.8 percent. Similarly, the age group 29 to 39 indicated a mere 4.4 percent of participants. As for gender, most respondents (75.8%) were males. These results support the general characteristic of the Namibian farming sector with the youth typically being less active in the agricultural sector, and with most farmers being males older than 40 years. Kew (2015) reports less than 10 percent of young people in Namibia being involved in agriculture. This may be attributable to the lack of policies encouraging young people to become involved in agriculture (Kew, 2015).

In terms of the level of education, the majority of respondents (51.3%) had no qualification. This was followed by those who had tertiary education at the certificate and diploma levels (20%). Only 11.1 percent of the respondents possessed a tertiary qualification, and 8.0 percent and 9.0 percent had completed primary and high school, respectively.

The study also measured respondents' main occupations before engaging in farming activities. The majority of respondents (56.3%) had experience working as clerks, secretaries, drivers,

and domestic workers immediately before engaging in farming, followed by 21.4 percent who had experience as supervisors (first-line management). Only 0.6 percent of the respondents had served in top management positions.

Regarding respondents' area or region of farming, the majority of respondents (49.9%) resided in the Omaheke region, followed by the Khomas region (18.3%) and the Hardap region (12.4%). In line with the purposive sampling method used in this study, the Omaheke, Khomas, and Hardap regions were prioritised for data collection as they are the nearest to Windhoek.

In terms of respondents' main farming activity, the majority of respondents (75.5%) engaged in livestock farming, followed by horticulture at 18.2 percent. Grain farming was represented at a negligible 0.2 percent of respondents. This reflects the population of this study, since livestock, particularly cattle farming, is the main agricultural production sector in Namibia (Hangara *et al.*, 2011).

As for the government scheme to support farmers, most of the respondents (58.2%) had benefited from the NRP scheme by acquiring agricultural land. This is supported by the fact that the government, in terms of its land redistribution policy, buys commercial farms and charges resettled farmers a negligible rental fee annually for the land. Respondents under the AALS represent 41.8 percent of the total sample.

The study also surveyed respondents' form of business ownership. Most of the respondents (59.1%) indicated that their farming operations were not registered; the reason being that the majority of those under the NRP scheme are resettled in loose groups and do not belong to cooperatives. Farmers in sole proprietorship (15.7%), who are ordinarily the beneficiaries of the AALS, were the second largest group. Sole proprietors usually buy commercial farmland as individuals (family) and register it as such at the Deeds Office.

In terms of the annual turnover of farming operations, the majority of respondents (53.5%) earned less than N\$50,000.00 annually from their farming operations. This was followed at 28 percent by those who earned between N\$101,000.00 and N\$500,000.00 annually from their farming operations. Only 0.2 percent earned above N\$1 million.

What the descriptive statistical analysis demonstrates is that the average respondent is male, between 40 and 60 years of age, not well educated, inexperienced at upper management levels, farms with livestock mainly in the Omaheke Region, and earns an average of N\$50,000.00, if not less, annually.

4.2 *Measurement models*

The statistical results of the various measurement models for each construct of the AEDM are presented in Table I. The results cover outer loadings of the items on the respective indicator, individual indicator reliability, constructs' composite reliability, and the contribution of each indicator to its construct as measured by average extracted variance (AVE). Table II presents the correlation between constructs, which is used to assess constructs' discriminant validity according to the Fornell-Larcker criterion by comparing each construct's AVE with its correlation with the other constructs.

[Insert Table I and Table II about here]

Entrepreneurial performance (EP), a reflective latent construct, was measured by the following indicators: growth in agricultural business (AB), agricultural start-ups (ASU), and competitiveness (CO). All three indicators AB (0.543), ASU (0.726), and CO (0.661) yielded individual indicator reliability values higher than the recommended minimum of 0.4 for exploratory research, with the preferred level being 0.7 (Wong, 2013). The composite reliability value of 0.844 is higher than the recommended level of 0.7, and the acceptable level of 0.6 in the case of exploratory research (Wong, 2013). This contributes towards supporting internal consistency reliability for EP. As for convergent validity, the AVE value of 0.644 is greater than the recommended minimum of 0.5 (Hair *et al.*, 2011; Wong, 2013). In Table II, discriminant validity for EP (0.802) is larger than all the correlation values in its row (0.466, 0.509, 0.712 and 0.694), and all the correlation values in its column (0.723, 0.000, 0.759 and -0.542). This provides supporting evidence for the construct's discriminant validity.

The supportive Environment (SE), a reflective latent construct, was measured using the indicators regulatory framework (RF), non-financial support (NFS), and social capital (SC). The role-model (RM) indicator was removed as an indicator owing to its non-significant loading on SE. According to Table I, RF and SC reported individual indicator reliability values of 0.830 and 0.661, respectively. Whilst NFS had a loading of 0.124, which is less than the

Table I: Measurement model statistics for latent constructs

Construct	Indicator	Outer loadings	Indicator Reliability (loadings ²)	Composite Reliability	AVE
EP	AB	0.737	0.543	0.844	0.644
	ASU	0.852	0.726		
	CO	0.813	0.661		
SE	NFS	0.352	0.124	0.756	0.538
	RF	0.911	0.830		
	SC	0.813	0.661		
CE	CU	0.640	0.409	0.614	0.294
	ET	0.456	0.208		
	FS	0.644	0.415		
	MC	0.378	0.143		
EO	P	0.584	0.341	0.608	0.341
	R	0.555	0.308		
	T&I	0.613	0.376		
EC	ES	0.377	0.142	0.809	0.533
	BS	0.919	0.845		
	TS	0.719	0.517		
	PM	0.794	0.630		

Table II: Fornell-Larcker criterion analysis for discriminant validity

	AP	AS	EC	EO	EP	INC	LIV	SE	CE
AP	1.000								
AS	0.527								
EC	0.766	0.414	0.730						
EO	0.675	0.294	0.622	0.584					
EP	0.694	0.712	0.509	0.466	0.802				
INC	0.881	0.505	0.773	0.671	0.723	1.000			
LIV	0.200	0.054	0.040	-0.031	0.000	0.116	1.000		
SE	0.788	0.652	0.659	0.511	0.759	0.764	-0.038	0.733	
CE	-0.501	-0.497	-0.488	-0.522	-0.542	-0.519	0.141	-0.558	0.542

recommended value of 0.4, the structural contribution was deemed relevant given the composite reliability and AVE values. The composite reliability and AVE values were higher than the recommended 0.6 and 0.5 values, respectively. Discriminant validity for SE (0.733) is higher than the correlation value in its column (-0.558), and larger than the correlation values in its row (-0.038, 0.511, 0.659 and 0.652). INC (0.764), EP (0.759) and AP (0.788) show values only marginally higher than 0.733. These are therefore considered to contribute towards supporting internal consistency reliability and convergent validity. Therefore, discriminant validity for SE is also supported.

The indicators of culture (CU), education and training (E&T), financial support (FS), and market conditions (MC) measured the cooperative environment (CE), a reflective latent construct. Table I indicates that only CU (0.409) and FS (0.415) have individual indicator reliability values above the recommended 0.4, with both ET (0.208) and MC (0.143) falling below the minimum level. However, composite reliability (0.614) is higher than the recommended 0.6, signifying that the reflective latent construct is reliable, overall. Even though the AVE falls below the recommended 0.5, composite reliability is adequate to confirm convergent validity for this construct (Fornell & Larcker, 1981). Regarding the discriminant validity reported in Table II, the correlation value for CE (0.542) is higher than the correlation values in its row. Consequently, the results provide support for the discriminant validity of the CE construct.

The indicators Risk-taking (R), Pro-activeness (P), and Technology and Innovation (T&I) measured EO, a reflective latent construct. According to Table I, P (0.341), R (0.308), and T&I (0.376) all have individual indicator values lower than the recommended value of 0.4. Composite reliability (0.608) is higher than the recommended 0.6, while the AVE value is lower than the recommended 0.5. Therefore, convergent validity is supported based on composite reliability (Fornell & Larcker, 1981). Table II indicates that discriminant validity for EO (0.584) is higher than the correlation values in its column for EP (0.466), LIV (-0.031), SE (0.511), and CE (-0.522). Only INC (0.671) reported a higher value. Besides AS (0.294), the value for EO is also lower than the correlation values (0.622 and 0.675) in its row. The results provide overall support for discriminant validity for EO.

Entrepreneurial skills (ES), business skills (BS), technical skills (TS), and performance motivation (PM) were indicators used to measure EC, a reflective latent construct. Mentorship

(MO) was removed as an indicator owing to its non-significant loading on EC. Apart from ES (0.142), individual indicator reliability values are higher than the recommended minimum of 0.4. Composite reliability and AVE values are above the recommended minimum of 0.6 and 0.5, respectively. This provides support for internal consistency reliability and convergent validity for EC. Discriminant validity for EC (0.730) is higher than the correlation values in its row (0.414), except for the correlation with AP (0.766). It is higher than the correlation with EO (0.622), EP (0.509), LIV (0.040), SE (0.659) and CE (-0.488), and only lower than the correlation with INC (0.773) in its column. Hence, discriminant validity for EC is largely supported.

The formative latent construct AS was measured by the indicators Agricultural Extension Services (XS); ecosystem, biodiversity, soil erosion (EBS); and climate change (CC). In the case of formative latent constructs, weights are the primary statistic for assessing formative indicators' relative contribution to the latent construct (Diamantopoulos *et al.*, 2008).

[Insert Table III about here]

As shown in Table III, all path coefficients between the indicators and AS are significant as they are higher than 1.96 at the 5% confidence interval using a two-tailed t-test. Moreover, according to Hair *et al.* (2011), the variance inflation factor (VIF) statistic should be lower than 5 to avoid multicollinearity, which is the case for all three indicators.

In conclusion, since the majority of the latent constructs' reliability and validity criteria were met, it was deemed that, overall, the data fit the measurement models. This constitutes sufficient grounds to proceed to structural model analysis.

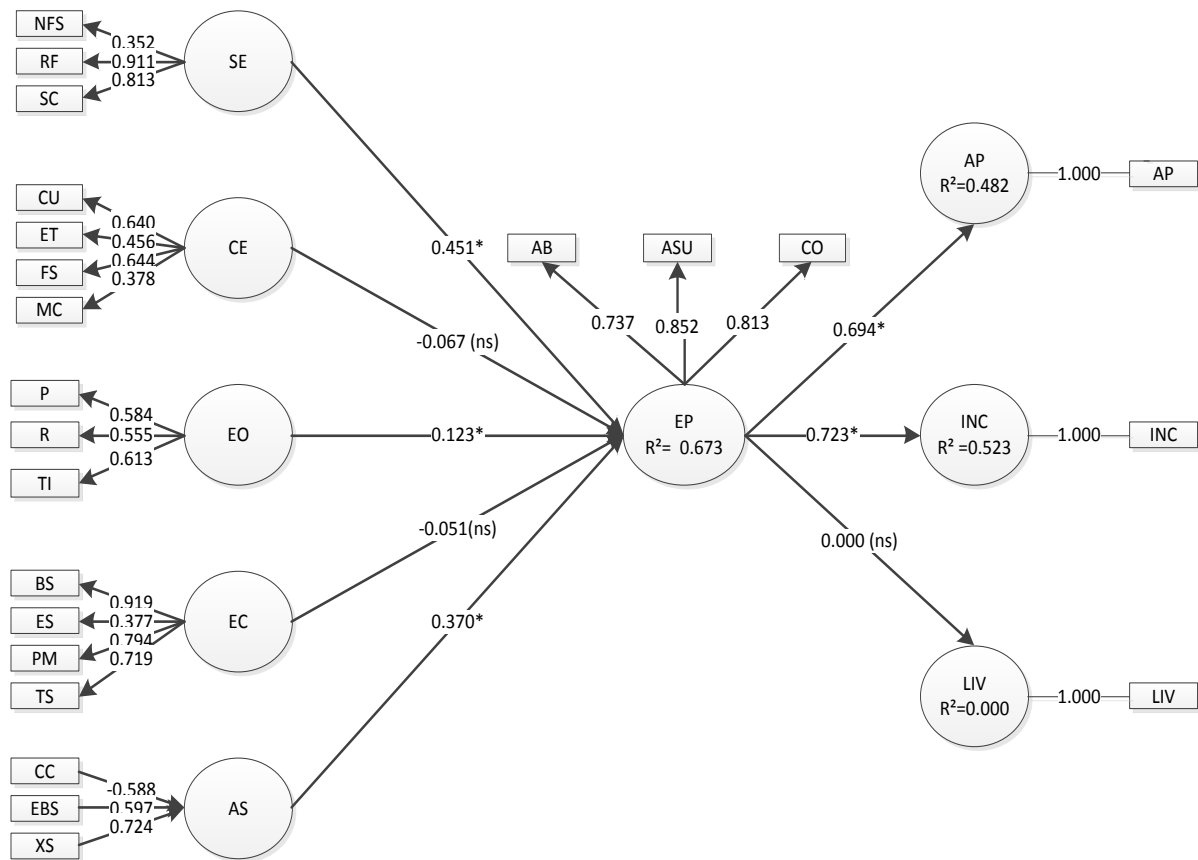
4.3 Structural model

The coefficient of determination (R^2) and the level of significance of the path coefficients are the primary evaluation criteria of the structural model. The amount of explained variance for each endogenous construct is indicated by R^2 . Path coefficients support the study's hypotheses to the extent that they are significant and that their sign concurs with the directional hypotheses (Hair *et al.*, 2011). Figure 3 reports the structural model with its R^2 -statistics and path coefficients.

Table III: Reliability and validity analysis for AS

Construct	Indicator	Outer weights	T Statistic	Outer VIF values
AS	XS	0.724	13.648	1.150
	EBS	0.597	11.159	1.171
	CC	-0.588	8.392	1.174

Figure 3: Structural model with direct effects



[Insert Figure 3 about here]

In this structural model, R^2 for the EP endogenous latent construct is 0.673, which means that the five exogenous latent constructs (SE, CE, EO, EC, and AS) and the three EP indicators (AB, ASU, and CO) explain 67.3 percent of the variance in EP. This is lower than the 0.75 norm for “substantial” variance explained as recommended by Hair *et al.* (2011), but higher than the minimum of 0.25 recommended by Wong (2013). Given the exploratory nature of this study, an R^2 value of 67.3 percent was deemed acceptable. The coefficient of determination for the endogenous constructs of AP, INC, and LIV, are 0.482, 0.523, and 0.000, respectively. This is neither substantial nor weak, but it means that EP moderately explains the variance in AP and INC, and it is higher than the recommended minimum of 0.25. There is no relationship between EP and LIV, as also corroborated by the null and statistically non-significant path coefficient.

An analysis of the path coefficients indicates that the enabling environment dimensions positively influencing EP are AS, SE, and EO. Therefore, only hypotheses H1, H2, and H4 were supported. The results also revealed that EP, in turn, positively influences AP and INC, giving support to hypotheses H6 and H7.

5 Discussion

The present section discusses the study’s results in the light of earlier findings, especially previous studies conducted in an African context.

The results confirmed a positive and strong relationship between SE and EP. This means that the supportive environment, as represented by the regulatory framework, non-financial support, and social capital (networking), is an important component in enhancing entrepreneurial performance in agriculture in the context of this study. This is in line with literature on the supportive environment (Carlsson *et al.*, 2013; Gnyawali & Fogel, 1994; Kiggundu, 2002; Klyver *et al.*, 2008) which purports that the above factors are necessary for creating an enabling environment for entrepreneurial performance. More specifically to the African context, this paper’s findings concur with previous empirical studies on the positive influence of access to markets—which may be an element of the regulatory framework and a type of non-financial support—on agricultural entrepreneurship (Kanayo, 2021; Wale *et al.*, 2021).

Considering the cooperative environment, the results revealed a non-significant relationship between CE and EP, meaning that the cooperative environment—as represented by culture, financial support, education and training, and market conditions—does not influence entrepreneurial performance. This outcome contradicts the literature on the cooperative environment (He, 2009; Lans *et al.*, 2014; Morris *et al.*, 2013; Nieman & Nieuwenhuizen, 2014) which advocates the presence of a positive attitude (culture), access to financial resources, and the provision of entrepreneurship education and training as important elements for promoting entrepreneurial performance in any setting, including agriculture. In an African context of investigation also, the literature seems to agree on the positive role played by financial support on agricultural entrepreneurship in Africa (Kanayo, 2021; Nukpezah & Blankson, 2017). However, forms of finance such as unearned or external income (Wale & Chipfupa, 2021) and social grants (Sinyolo *et al.*, 2017) appear to work against agricultural entrepreneurial performance in Africa. Hence, while financial support is crucial for entrepreneurship in the African agriculture sector, a paradigm shift is needed (Wale & Chipfupa, 2021). The fact that culture as a dimension of the cooperative environment does not impact agricultural entrepreneurship positively may be ascribed to a culture of entitlement and expectation by African farmers (Wale & Chipfupa, 2021). Finally, while this paper's findings do not concur with other studies on the positive role played by education and training in improving agricultural entrepreneurial practices in Africa (Adeyanju *et al.*, 2021), this may be due to different pedagogical approaches in entrepreneurship education and training (Nabi *et al.*, 2017).

The results for the entrepreneurial orientation construct confirmed a positive but not strong relationship with entrepreneurial performance. This means that entrepreneurial orientation, as represented by risk-taking, pro-activeness, and technology and innovation, plays a catalytic role in promoting entrepreneurial performance in agriculture. This outcome corroborates the literature on entrepreneurial orientation (Covin & Slevin, 1989; Lumpkin & Dess, 1996; Miller, 1983; Sarri *et al.*, 2010; Suman *et al.*, 2014) which reasserts that this dimension is crucial for enhancing entrepreneurial performance in agriculture. Regrettably, there are no studies on the influence of entrepreneurial orientation on agricultural entrepreneurship in an African context, except for Mupfasoni *et al.* (2018)'s analysis of the entrepreneurial orientation profile of farmers (scoring highest on the proactiveness dimension) and Le Roux and Bengesi's (2014) study focussing on the performance of SMEs.

We found a non-significant relationship between entrepreneurial competencies and entrepreneurial performance, which means that this construct—as measured by entrepreneurial skills, business skills, technical skills, performance motivation, and mentorship—has no bearing on entrepreneurial performance in our context of investigation. On the contrary, literature exists (Antonites, 2003; Chang, 2009; Morris *et al.*, 2013; Sousa, 2018; Timmons & Spinelli, 2007) supporting the notion that the above factors are necessary for the enhancement of entrepreneurial performance. Kanayo (2021) reports a positive association between female entrepreneurs' entrepreneurial skills and success in South Africa, but his study's sample was not limited to the agriculture sector. Consequently, a more granular investigation of the relationship between entrepreneurial competencies and entrepreneurial performance in the context of agriculture is warranted.

The results for agricultural sustainability confirmed a positive and moderately strong relationship with entrepreneurial performance, implying that this construct, as represented by extension services (the provision of technical support and infrastructure to farmers), climate change (change in weather patterns that results in drought and floods), and ecosystem, biodiversity and soil erosion (preservation of natural resources such as plants and animals, and the proper management of land), play a catalytic role in promoting entrepreneurial performance in the agriculture sector. This is in line with literature on entrepreneurial performance (Dale *et al.*, 2013; Hall *et al.*, 2010; Pretty, 2008) which asserts that for entrepreneurial performance to be enhanced, the issue of agricultural sustainability needs to be taken seriously by addressing the above sustainability factors. In Africa, Nkambule and Dlamini's (2012) review highlights the impact of adverse climatic and environmental factors for agriculture, and Koyenikan and Anozie (2017) empirically focus on the need for climate change adaptation amongst farmers. Overall, these findings highlight the need to treat entrepreneurial aspects conjointly with more purely agricultural aspects relating to the environment and extension services. We believe that one of the contributions of the present study is precisely the simultaneous consideration of factors from both the entrepreneurship and agriculture domains in the AEDM.

The results for entrepreneurial outcomes confirmed a positive and very strong relationship between entrepreneurial performance and both agricultural productivity and incomes. These findings are in agreement with the literature, also in an African context, with studies reporting a positive influence of agricultural entrepreneurial performance on productivity (Diochon *et*

al., 2017; Kriese *et al.*, 2021). The same can be attested for the increased incomes as an entrepreneurial outcome of agricultural entrepreneurship in Africa (Adeyanju *et al.*, 2021; Dorsey, 1999; Ras & Vermeulen, 2009). Another contribution of the present study is the concomitant investigation of drivers and outcomes of agricultural entrepreneurship in Africa, hence providing evidence for the utility of agricultural entrepreneurship based on the positive outcomes it produces.

In the case of the improved-livelihoods construct, we found a non-significant relationship between entrepreneurial performance and this entrepreneurial outcome. This result is in contrast with previous research in Africa attesting to a positive influence of agricultural entrepreneurial activities on farmers' livelihoods (Mumuni & Oladele, 2016; Mwaura, 2017). The empirical finding that entrepreneurial performance in agricultural activities leads to increased incomes but not to improved livelihoods appears counter-intuitive at first sight and needs further investigation. If entrepreneurial performance in agriculture appears to lead to improved productivity and incomes, one would expect farmers' livelihoods to also improve. However, we need to keep in mind that in communities found in developing contexts, incomes may be redistributed well beyond the boundaries of one's household to meet the needs of the community (Peredo & McLean, 2013). Research in this context needs to account for and investigate these communal dynamics.

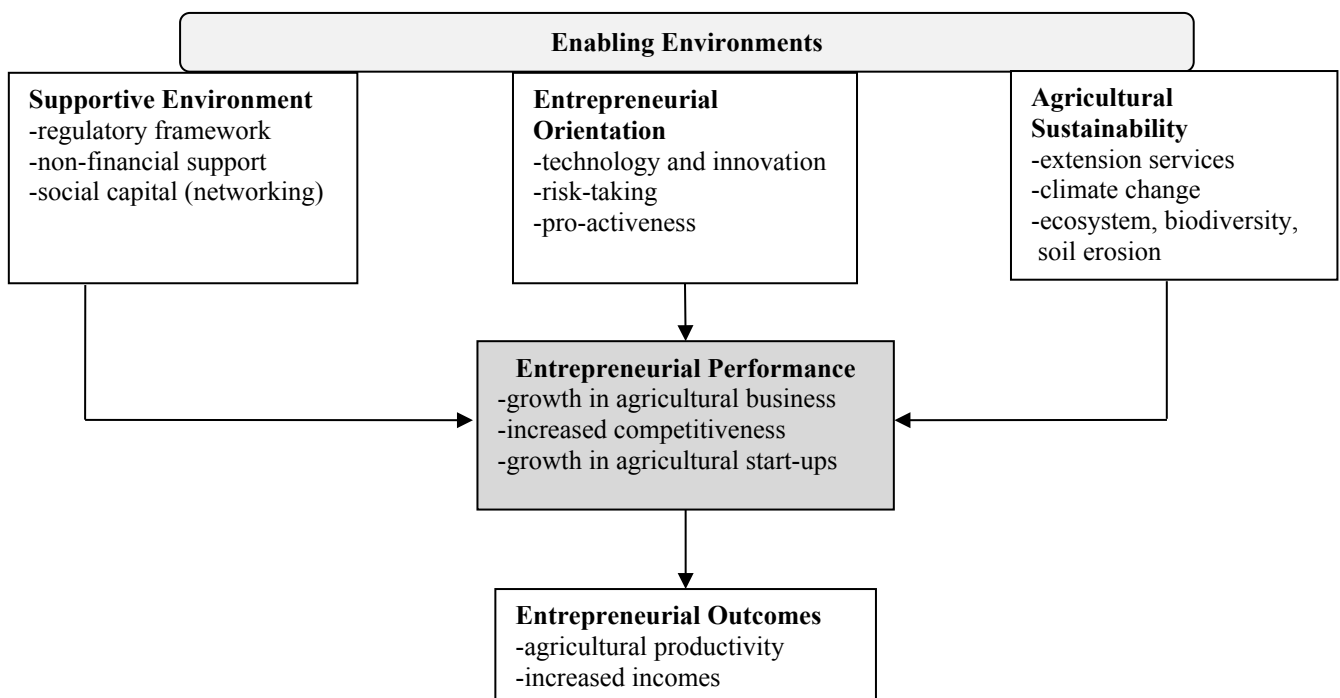
6 Conclusions and implications for theory and practice

This study sought to develop and test a model for the development of agricultural entrepreneurship in an African context. The theoretical part of the study reviewed the literature on entrepreneurship and agriculture, including sustainable agriculture, which resulted in the formulation of a conceptual AEDM. The empirical part of the study involved the transformation of the conceptual model into a statistical model and the empirical testing thereof. The final empirically tested AEDM is depicted in Figure 4.

[Insert Figure 4 about here]

Given the scarce and fragmentary literature on models of agricultural entrepreneurship development, especially in the African context, this study represents a valuable contribution in its effort to develop a holistic, more comprehensive model encompassing a plethora of antecedents under the enabling-environment domain. The AEDM also makes a theoretical

Figure 4: Final Agricultural Entrepreneurial Development Model



contribution in its attempt to verify the relevance of entrepreneurial performance in agriculture by determining whether it leads to certain outcomes for farmers and farming activities.

The findings of the empirical testing of the model indicate that the data fit the AEDM fairly well and, therefore, that this model may be a useful tool for enhancing entrepreneurial performance in the agriculture sector. However, the relationship between entrepreneurial performance and the exogenous constructs cooperative environment and entrepreneurial competencies, which was statistically non-significant in this study, should be explored further as these enabling-environment dimensions are commonly recognised as being crucial for the development of entrepreneurship. The impact of entrepreneurial performance in agriculture on farmers' livelihoods could also be investigated further, as the relationship between these constructs was not confirmed in this study.

From a practice perspective, the study offers policymakers an initial blueprint of how agricultural entrepreneurship may be fostered. Such policy-making efforts should focus on the enabling-environment dimensions that, in this study, had a bearing on agricultural entrepreneurial performance, namely the supportive environment, entrepreneurial orientation and agricultural sustainability. Policies need to aid farmers in overcoming challenges relating to climate change, the ecosystem, biodiversity and soil erosion affecting different areas of the continent (Koyenikan & Anozie, 2017; Nkambule & Dlamini, 2012; Zhou *et al.*, 2013). Non-financial support such as access to markets and extension services should accompany policies as well (Wale & Chipfupa, 2021), particularly since it is evident that financial support alone is not conducive to agriculture entrepreneurship and may even be counter-productive (Sinyolo *et al.*, 2017) if not made available together with non-financial support (Wale & Chipfupa, 2021). The role played by entrepreneurial orientation confirms the policy discourse on targeting farmers with the appropriate entrepreneurial make-up (Dobryagina, 2019; Sumberg & Okali, 2013). Finally, considering the results of this study about the positive impact of the supportive environment, entrepreneurial orientation and agricultural sustainability on agricultural entrepreneurial performance, policies should focus on entrepreneurship and agriculture conjointly (Kriese *et al.*, 2021), be more grounded in specific contexts (Sumberg & Okali, 2013) and account for indigenous knowledge in agricultural practices (Wale & Chipfupa, 2021).

This paper also highlights important entrepreneurship development dimensions to institutions engaged in the entrepreneurial development of farming activities, so that their efforts may potentially be more effective. In particular, the AEDM underscores the importance of developing certain attributes (e.g., proactiveness) and at the same time ensuring that certain enabling-environment conditions (e.g., access to markets) are in place as they *collectively* foster entrepreneurial performance and certain entrepreneurial outcomes for farmers. For instance, such institutions should facilitate networking amongst farmers and between farmers and important institutions in the farming/entrepreneurial ecosystem (Wale *et al.*, 2021). Entrepreneurship education and training in the agriculture sector should also focus on developing key entrepreneurial orientation dimensions in farmers, such as risk-taking (Dorsey, 1999; Wale & Chipfupa, 2021). There is also a need to help farmers to make a mindset shift away from a culture of entitlement and expectations from government (Wale & Chipfupa, 2021).

Finally, the model tells farmers in similar contexts what personal dimensions (e.g., innovativeness) they should develop for them to carry out sustainable agricultural practices, as well as the environmental aspects (e.g., social capital, non-financial support) that contribute to their entrepreneurial performance.

The findings of the study provide a basis for further research in agricultural entrepreneurship. However, some limitations need to be pointed out. This study represents one of the few efforts to consider entrepreneurship development in agriculture holistically, as most studies focus on a few aspects of the entire system (Dias *et al.*, 2019a, 2019b; Fitz-Koch *et al.*, 2018). However, the effort to develop and test a more comprehensive model meant, at the same time, that not all possible variables could be included in one single study because of the need to keep the model as parsimonious as possible. As mentioned previously, our choice of which dimensions to include in the model and, ultimately, measure and test was also dictated by the characteristics of the study's sample. Other studies with a similar objective may include other development dimensions based on their theoretical lens and context of the investigation. Another limitation is that all the items used in the data collection instrument were self-reporting measures. While this choice was made to collect data that is most applicable to each respondent's specific local (rural) context, an alternative approach could be to collect more objective data about environmental factors such as climate change and agricultural extension services. Finally, whilst providing a rather lengthy description of our sample to ensure the study's replicability

and the generalisability of its results to other contexts, the inability to use probability sampling across the entire population of African farmers means that future research should corroborate the results of this study in similar contexts before making practical use of the final AEDM.

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