A more grounded view of 'farmer entrepreneurship': how Zimbabwean smallholder farmers fundamentally differ in their entrepreneurial behaviours

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Abstract

Purpose – This paper aims to investigate the entrepreneurial behaviours exhibited by commercial smallholder farmers in Zimbabwe, focusing on their socio-economic characteristics, and considers their implication for outcomes of livelihood resilience in a resource-constrained and turbulent rural context.

Design/methodology/approach – The study used survey data collected from 430 smallholder farmers in Masvingo province, Zimbabwe. Using a two-step cluster analysis, the study constructed a typology of farmers based on their entrepreneurial behaviour and socio-economic characteristics.

Findings – The results revealed that commercial smallholder farmers are heterogeneous in terms of their entrepreneurial behaviours. Four clusters were identified: non-entrepreneurial, goal-driven, means-driven and ambidextrous. Beyond their entrepreneurial behaviours, these clusters significantly differ in the socio-economic characterises (gender, age, education levels, farm size, proximity to the market and social connection) and farm performance (seasonal sales per hectare and farm income per hectare).

Research limitations/implications – The typology framework relating farmers' entrepreneurial behaviours to their socio-economic characteristics and business performance is important to tailor and therefore

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improve the effectiveness of farmer entrepreneurship programmes and policies. In particular, tailoring farmer entrepreneurship education is crucial to distribute land, finance and market resources in purposive ways to promote a combination of smallholder farmers' effectual and causal behaviours at an early stage of their farm ventures.

Originality/value – Researchers still know little about which farmers' behaviours are entrepreneurial and how these behaviours manifest in action during their commercial farm activities. This research leverages effectuation and causation theory to unveil previously overlooked distinctions on farmers' entrepreneurial behaviours, thereby enhancing a more grounded understanding of farmer entrepreneurship in a resource-constrained context.

Keywords Entrepreneurial behaviours, Smallholder farmers, On-farm entrepreneurship, Africa

Paper type Research paper

1. Introduction

Across several scientific disciplines and policy debates, farmer entrepreneurship – a concept that broadly entails the effective reconfiguring and recombining of natural, financial, social and physical resources in and around farms to attain benefits, reduce costs or mitigate risks (Dias *et al.*, 2019; Yang *et al.*, 2022) – does not only play a crucial role in addressing poverty (Bruton, *et al.*, 2013; Naminse and Zhuang, 2018) but also in facilitating adaptation to and coping with socio-ecological shocks (Kangogo *et al.*, 2021; Manyise and Dentoni, 2021).

Despite the importance of farmer entrepreneurship for tackling complex social and ecological challenges, we argue that we still have little understanding about *which* farmers' behaviours are entrepreneurial, and *how* these are entrepreneurial. Existing studies have extensively debated how to assess farmer entrepreneurship based on their traits (Schiebel, 2005), skills (McElwee, 2008; Vesala and Pyysiäinen, 2008), identities (Vesala and Vesala, 2010), goals and values (Niska *et al.*, 2012), attitudes (Austin *et al.*, 1996; Rosairo and Potts, 2016; Morris *et al.*, 2017; Spicka, 2020) and mindsets (Bhullar *et al.*, 2023; Chipfupa and Wale, 2018). These studies do not capture the essence of farmer entrepreneurship in action. In support of this argument, research on farmers' skills (Morgan *et al.*, 2010; Phelan, 2014) suggests that farming is an entrepreneurial process that requires behaviours such as assessing, combining and recombining resources (financial, human, physical, natural and social) to create value (Gartner *et al.*, 1992). In their entrepreneurial process, farmers search for new sources of inputs, experiment with new varieties and production methods and create or discover new markets (Dias *et al.*, 2019). Although it is important to understand farmers' entrepreneurial behaviours, we still have little guidance from the farmer entrepreneurship literature on how to observe, operationalize and discern them.

To advance our understanding of farmers' entrepreneurial behaviours, we therefore turn our attention to the more general entrepreneurship literature on entrepreneurial behaviours. Outside the farming context, the entrepreneurship literature reveals the importance of causal and effectual behaviours in influencing business outcomes (Smolka *et al.*, 2018; Yu *et al.*, 2018; Shirokova *et al.*, 2020). Causal entrepreneurial behaviour, which involves predictive, goal-oriented value creation activities (Sarasvathy, 2001a, 2001b; Chandler *et al.*, 2011) helps overcome resource constraints by ensuring effective management of scarce resources (Yu *et al.*, 2018). Conversely, effectual entrepreneurial behaviour, characterized by non-predictive value creation driven by the means available in a given moment, allows for swift adjustments to environmental changes and the effective coping with resource constraints (Shirokova *et al.*, 2020). Inquiries into the multifaceted heterogeneity of effectual and causal behaviours have predominantly been circumscribed to technologically advanced sectors and higher-income western contexts (Brettel *et al.*, 2012; Cai *et al.*, 2017; D'Andria *et al.*, 2018; Harms and Schiele, 2012; Magalhaes and Abouzeid, 2018; Mthanti and Urban, 2014; Roach *et al.*, 2016; Ruiz-Jiménez *et al.*, 2020; Shirokova *et al.*, 2020; Smolka *et al.*, 2013; Yu *et al.*, 2018), which substantially differ from the agricultural sectors in developing countries in terms of resources constraints and level of uncertainty (Cala *et al.*, 2015; Alva *et al.*, 2021). Nevertheless, no study

has yet sought to understand farmers' entrepreneurial behaviours from a causation and effectuation theory perspective. This knowledge gap hinders the development of effective strategies and policies for fostering farmers' entrepreneurial behaviours, with important missed pathways of behavioural change towards tackling urgent socio-ecological problems.

To address this knowledge gap, our study focuses on understanding which farmers' behaviours are entrepreneurial, and how, by empirically developing typologies based on the notions of effectuation and causation from the context of smallholder farming in rural Zimbabwe. As an empirical window to study farmers' entrepreneurial behaviours, we zoom into the case of Zimbabwean farmers participating in farmer-led seed multiplication business initiatives, which are increasingly relevant in sub-Saharan Africa (McGuire and Sperling, 2016). Hence, our study's overarching objectives are threefold:

(1) to identify distinctive causal and effectual entrepreneurial behaviour profiles among commercial smallholder farmers;

(2) to gain a comprehensive understanding of the socio-economic characteristics and performance outcomes associated with each entrepreneurial behaviour profile; and

(3) to formulate targeted recommendations for each group of farmers based on their specific entrepreneurial behaviours.

By examining farmers' entrepreneurial behaviours in the agricultural context of a developing country, this study makes two key contributions to the field of farmer entrepreneurship. Firstly, it constructs typologies of farmers' entrepreneurial behaviours within resource-constrained rural settings in sub-Saharan Africa. Secondly, it provides insights into how farmers' entrepreneurial behaviours systematically relate to their socio-economic characteristics and business performance. Through these contributions, this study provides scientific ground on how to tailor entrepreneurship capacity development to the specific farmers' profiles and needs, leading to the design of more tailored farmer entrepreneurship development programmes. Based on these contributions, we suggest possible ways of supporting farmer entrepreneurship in the resource-constrained farming contexts, such as in rural Zimbabwe, to improve performance and facilitate tackling socio-ecological problems.

2. Bringing farmers' entrepreneurial behaviours to the context of rural Zimbabwe

Although the notion of farmer entrepreneurship continues to evolve, the concept of farmer entrepreneurial behaviour remains relatively ambiguous and very context-dependent. Farming exhibits a process of value creation akin to that found in any entrepreneurial organization (Lans *et al.*, 2013; Mupfasoni *et al.*, 2018). Accordingly, farmers' entrepreneurial behaviours can be referred to as a series of actions during the start-up phase and in the running of a farm business (Ntow *et al.*, 2023). Given its context-dependency, in Section 2.1, we contextualize farmer entrepreneurship to the agricultural history of Zimbabwe. This context of rural Zimbabwe calls for a deeper scientific understanding of farmers' entrepreneurial behaviours which, now, we argue that we lack in our field. Consistently with this need, in Section 2.2, we connect Sarasvathy (2001a, 2001b)'s notion of causal and effectual entrepreneurial behaviours, and its linkages with farmers' socio-economic characteristics and performance, to the context of rural Zimbabwe.

2.1 Farmer entrepreneurship in the context of rural Zimbabwe

Considered the mainstay of the economy, Zimbabwean agriculture has been recognized as paramount for improving food security, raising rural incomes and fostering economic growth (Bautista, 1998; Rukuni *et al.*, 2006). The agricultural sector has undergone major structural

transformations since 1980. It has transitioned from a dualistic landscape, wherein, before 1980, large-scale white commercial farmers dominated the productive lands, whereas smallholder farmers, predominantly comprising black individuals, were confined to less fertile tracts plagued by poor soil fertility, erratic rainfall patterns, high temperatures and soil erosion. In the aftermath of the 2000 accelerated land reform programme, which involved the acquisition of land from large-scale commercial farmers and its allocation to black individuals (Scoones *et al.*, 2012), the sector has witnessed a shift, now being dominated by approximately 1.5 million smallholder farmers, who cultivate an average of 2 hectares of land (ZIMSTAT, 2019; Muchetu, 2019). This rectification not only sought to address the long-standing and deeply entrenched inequalities but also to facilitate the commercialization of the reform beneficiaries through targeted support, capacity building and access to markets (Scoones *et al.*, 2018; Shonhe, 2022). One critique is that the current smallholder commercialization and policy reforms have blunted capacity-building activities and incentives, hindering their ability to fully exploit the productive potential of their farms and adjust to prevailing socio-ecological shocks (Bahta *et al.*, 2020; Mashizha, 2019; Mhembwe *et al.*, 2019).

Smallholder farmers in Zimbabwe have been known for being largely subsistence oriented, allocating small portions of their land for growing commercial crops such as tobacco, maize, wheat, cotton, sugar, horticultural crops, groundnuts and soybeans (ZIMSTAT, 2019). In recent years, supported by the changes in policy environment, smallholder farmers are now increasingly engaged in other high-valued agricultural enterprises, in particular, involved in certified seed multiplication business initiatives (McGuire and Sperling, 2016; Munyaka *et al.*, 2017; Genesis Analytics, 2018; Vernooy *et al.*, 2022). Although farmers participate in these business initiatives to meet their basic needs, they are called to plan and adapt their use of resources because, both on a seasonal and on everyday basis, they face uncertainty due to climate change, fluctuating commodity prices and inflation (Šūmane *et al.*, 2018; Mashizha, 2019). Smallholder farmers also face challenges such as poor access to market information, poor input supply, lack of credit and high transport costs because of poor road infrastructure. The situation is worse for Zimbabwean smallholder farmers in marginalized rural area where markets are underdeveloped, infrastructure is poor, search and information costs are high and resources are limited (Dube, 2020). Farmers need to collaborate with other farmers, co-create new varieties with companies, experiment, take calculated risks and investment decisions that are responsive to changing market and environmental conditions (Bullough and Renko, 2013; Chrisman *et al.*, 2011; Milestad and Darnhofer, 2003; Mashizha, 2019). Evidence suggests that the ability to cope and adjust depends on the farmers' ability to enact entrepreneurial behaviours in managing scarce resources as well as flexibility to adjust to changing environment (Mashizha, 2019).

2.2 Entrepreneurial behaviours, socio-economic characteristics and performance

According to Sarasvathy (2001a, 2001b), entrepreneurial behaviours can be interpreted, from a process-based perspective, using the lens of *causation* and *effectuation*. Effectual behaviour involves entrepreneurial individuals using non-predictive, proactive, emergent, flexible and experimental strategies to navigate the uncertainties inherent in their operating environment. Effectual actors acknowledge the limitations of planning and forecasting in such unpredictable conditions and instead rely on decision-making heuristics that focus on manageable and affordable risks, considering what is at hand and controllable (Chandler *et al.*, 2011). Alternatively, causal behaviour places emphasis on future predictions, strategic planning and resource mobilization to achieve specific objectives and maximize profits. This approach combines goal-setting with competitive analysis and the prevention of unexpected outcomes (Mintzberg, 1978; Ansoff, 1965; Sarasvathy, 2008). Causal-oriented individuals envision goals and then mobilize resources to attain them (Chandler *et al.*, 2011).

Based on effectuation theory (Sarasvathy, 2001a, 2001b, 2008), farmers displaying effectual behaviour, ensuring that potential losses are tolerable even in the worst-case scenario. Simultaneously, they forge partnerships with fellow farmers, input suppliers and product buyers to mitigate uncertainty. By experimenting with available resources, they uncover novel methods, products and market opportunities. On the other hand, farmers displaying causal behaviour, prioritize achieving precise farm targets promptly. They also seek to optimize returns from their enterprises, such as sales volume and profits, while actively mitigating surprises through strategies like maintaining high inventories and seeking market information (Appendix 1).

Understanding effectual and causal behaviours among commercial farmers, and their linkage with performance and socio-economic factors, would aid in purposefully identifying and targeting specific smallholder farmers according to their unique needs (Chipfupa and Wale, 2018). This targeted approach will enhance their ability to cope with and adapt to the challenges they face more effectively (Mashizha, 2019). The relationship between different entrepreneurial behaviours and performance outcomes, in particular, has been already subject of scholarly debate, yet little in the agricultural context. Several studies suggests that effectual behaviours can help farmers to navigate uncertainty, make the most of their resources, foster collaboration and embrace innovative farming practices while causation helps aligning efforts towards achieving specific targets, understanding market conditions, managing risk, resource mobilization and scaling operations (Shirokova *et al.*, 2020; Smolka *et al.*, 2013; Yu *et al.*, 2018). As highlighted earlier, these studies suggests that a combination of these behaviours yield superior outcomes (Smolka *et al.*, 2013; Shirokova *et al.*, 2020), yet we still do not know how these behaviours interrelate with farm performance in rural settings of a developing country.

Entrepreneurship has been also associated with several socio-economic factors, and these characteristics remains a subject of debate in entrepreneurship research (Gupta *et al.*, 2019; Spicka, 2020; Yang *et al.*, 2020) – yet, again, little of this research is applied to the peculiar farming context. First, evidence shows that individual characteristics such as gender differences affect access to resources (Powell and Eddleston, 2013). Scholars argue that limited access to resources and decision-making shape perceptions (Hmieleski and Sheppard, 2019), and therefore also entrepreneurial behaviour. Equally important is that one's education level not only enhances managerial capabilities but also generates broader entrepreneurial options (Jiménez *et al.*, 2015). Consistent evidence suggest that education broadens the entrepreneurial activities of farmers (Mojo *et al.*, 2017) and market participation (Randela *et al.*, 2008).

Similarly, entrepreneurship research show that entrepreneurial behaviour is tied to one's resources. Research on farmer entrepreneurship have extensively debated the role of social networks (Grande *et al.*, 2011) and farm size (Barbieri and Mshenga, 2008), in particular. Grande *et al.* (2011) argued that social networks are important for rural farm business owners due to their less favourable geographical locations, where access to information is limited. By being socially connected through friends or being a member of a producer organization, a farmer is kept updated with new information, technology trends and methods of production (Scott and Richardson, 2021). Several studies demonstrate that social networks facilitate knowledge exchange, social support and collaboration (Andreatta and Wickliffe, 2002; Spielman *et al.*, 2011). Similarly, farm size has been considered a property resource that influence entrepreneurial behaviour (Barbieri and Mshenga, 2008; Yeboah *et al.*, 2020). Barbieri and Mshenga (2008) show that a larger farm size facilitates experimentation with different cropping varieties. Access to large farms allows farmers better plan for longer-term investments (Morris *et al.*, 2017).

In addition, farms located closer to the market may have location-specific advantages compared to farms located far from the market (Grande *et al.*, 2011). By being closer to the market, not only are the information exchange benefits from market participation high (Hinrichs *et al.*, 2004), but search and information transaction costs are also minimized (Lu *et al.*, 2008). Of course, with the advances in communication methods, the relevance of location may be varied (Grande *et al.*, 2011). However, considering this may not be true for smallholder farmers in rural parts of Africa where infrastructure is poor and internet access is limited (Ochieng *et al.*, 2020), it may still be argued that farmers located closer to the market may exercise higher levels of entrepreneurial behaviour compared to their distant farmer counterparts.

3. Methodology

3.1 Study area

Taking an exploratory case study approach, this research was carried out in four out of the seven districts (Masvingo, Bikita, Zaka and Gutu) situated in the south-eastern province of Masvingo, Zimbabwe. This region is geographically positioned at a latitude of −20° 04′ South and a longitude of 30° 49′ East, bordered by Mozambique to the East, and the provinces of Matabeleland South to the southwest, Midlands to the northwest and Manicaland to the northeast. As is common in other districts within Masvingo Province, agriculture represents the primary economic activity in these selected regions. Although farming in this province leans towards subsistence, farmers are progressively engaging in agricultural enterprises catering to both local and external markets (Dube, 2020). Notably, this research centred its focus on commercial smallholder farmers involved in the certified seed business sector.

3.2 Sampling and data collection

The sampling and data collection process involved a meticulous three-step approach. Initially, we conducted semi-structured interviews with 35 purposively selected smallholder farmers to gain insights into entrepreneurial activities and processes within the certified seed business sector and subsequently shape the quantitative measurement instrument. In line with the process-oriented perspective of causation and effectuation entrepreneurial behaviours (Brettel *et al.*, 2012; Shirokova *et al.*, 2020), our interview questions were confined to the first three years of establishing a farm business to improve recalling and reduce bias. The invaluable insights obtained from these interviews were then used to adapt the effectuation and causation item questions proposed by Chandler *et al.* (2011) to suit the context of commercial smallholder farmers.

Subsequently, a comprehensive questionnaire was developed and subjected to pretesting among purposively selected 15 commercial smallholder farmers in diverse locations of the study to ensure its clarity, precision and absence of ambiguities or misunderstandings (Babonea and Voicu, 2011). This adapted questionnaire encompassed various topics, including respondent socio-economic characteristics, entrepreneurial behaviours, production information and farm revenue.

In the final step, a survey was conducted among 430 commercial smallholder farmers in January 2020. To identify the survey participants, a multi-stage random sampling strategy was followed (Ardilly and Tillé, 2006). The sampling frame comprised all commercial smallholder farmers engaged in the seed certification business in Masvingo, Bikita, Zaka and Gutu districts. Within these four districts, a deliberate selection was made of seven distinct district wards: three located in the Zaka district (Ward 1, Ward 2 and Ward 15), two in the Masvingo district (Ward 13 and Ward 23), one in the Bikita district (Ward 10) and another in the Gutu district (Ward 13). For each of these district wards, a list was compiled of commercial farmers who had initiated their farm businesses within the preceding three to

four years, using records obtained from local government extension officers. Notably, certain district wards exhibited a higher concentration of active commercial farmers compared to others. To ensure a representative and unbiased sample that accurately reflected the characteristics of commercial smallholder farmers in the target districts, a probability proportionate-to-size sampling approach was used. This approach led to the selection of 77 farmers from Masvingo Ward 23, 74 from Zaka Ward 1, 51 from Zaka Ward 2, 72 from Zaka Ward 15, 32 from Masvingo Ward 13, 51 from Bikita Ward 10 and 66 from Gutu Ward 13 for the survey.

The field survey was conducted by a team of seven enumerators, guided by one supervisor. Prior to data collection, these enumerators underwent rigorous training to familiarize them with the details of the questionnaire. In addition, a WhatsApp group was established for all enumerators and the supervisor to facilitate real-time clarification of questions, sharing challenges and exchanging experiences. The response rate for the survey was an impressive 98%. Detailed characteristics of the respondents are presented in Table 1.

3.2 Data analysis

The data analysis process comprised three distinct stages: data preparation, core analysis and cluster validation. During data preparation, data reduction techniques were systematically used, aligning with the inherent characteristics of the dataset. Subsequently, in the core analysis stage, cluster analysis (CA) was rigorously conducted to effectively delineate and categorize discrete groups of farmers based on their specific entrepreneurial behaviours. Finally, in the cluster validation stage, analysis of variance (ANOVA) and Pearson's Chi-square test of independence were used to assess the statistical significance and validity of the identified clusters.

3.2.1 Data preparation. To prepare the data on causation and effectuation behaviours for CA, an exploratory factor analysis was conducted. This multivariate statistical technique reduces observable variables to a few latent variables with a common variance structure (Hair Black *et al.*, 2014). Convergent validity tests were performed for effectuation and causation elements. The factorability of the data was confirmed using Kaiser-Mayer-Olkin (KMO) (Kaiser, 1970) and Bartlett's test of sphericity (Bartlett, 1950), indicating suitability for factor analysis (KMO > 0.5; Bartlett test: $\rho < 0.05$) (Hair *et al.*, 2010). Varimax rotation simplified the factor solution, resulting in four retained discriminating factors: causation with eight items, experimentation with four items, flexibility with three items and affordable loss with two items. These factors demonstrated internal consistency ($\alpha > 0.7$). The total scores of the items for each retained factor were used for subsequent CA, following established practices (Shirokova *et al.*, 2020). Detailed results of the data reduction process are available in Appendix 2.

3.2.2 Core analysis. The subsequent step involved conducting a CA, a technique for constructing typologies and classifying observations based on observable similarities (Hair *et al.*, 2010). Given our data's categorical and continuous nature, a two-step cluster analytical approach in SPSS ver. 25 proved most suitable (Bacher *et al.*, 2004). The two-step cluster analysis (TSCA) involves pre-clustering cases using a modified hierarchical agglomerative procedure to form homogenous sub-clusters, followed by actual clustering using an agglomeration clustering algorithm (Norušis and Spss, and Inc, 2011; Crum *et al.*, 2020). To determine the optimal number of clusters, the log-likelihood distance was used.

TSCA was preferred for its ability to handle large data sets efficiently, accommodate both categorical and numerical data (unlike partitioning methods like *k*-means) and automatically determine the optimal number of clusters based on criteria such as Schwarz Bayesian information criterion or Akaike information criterion (Crum *et al.*, 2020; Şchiopu, 2010). Its increasing relevance in entrepreneurship research is evident from various studies

Table 1.
Socio-economic characteristics of respondents

Variable	Masvingo Ward 23	Zaka Ward 1	Zaka Ward 2ru	Zaka Ward 15	Masvingo Ward 13	Bikita Ward 10	Gutu Ward 13	Statistic
N	77	74	51	72	32	51	66	
Sex								
Female	59.7	51.4	49.0	47.2	56.3	29.4	39.4	
Male	40.3	48.6	51.0	52.8	43.8	70.6	60.6	14.511**
Education								
≤ Secondary	46.8	47.3	43.1	50.0	34.4	43.1	42.4	
> Secondary	53.2	52.7	56.9	50.0	65.6	56.9	57.6	2.760
Age	57.57 (10.84)	54.30 (11.30)	58.02 (11.14)	54.60 (8.74)	57.25 (13.18)	55.60 (12.60)	56.71 (11.2)	1.126
Household size	5.08 (1.82)	6.09 (1.61)	6.12 (2.29)	7.34 (2.58)	5.94 (1.64)	7.10 (2.14)	6.15 (2.12)	9.143***
Total owned farm size	3.43 (1.66)	3.34 (3.32)	2.53 (1.07)	2.68 (0.82)	1.41 (0.66)	5.00 (1.23)	2.31 (1.24)	36.740***
Farm size under business use	0.52 (0.13)	0.61 (0.28)	0.47 (0.29)	1.43 (0.51)	0.54 (0.12)	0.98 (0.78)	1.01 (0.35)	84.399***
Distance to the market	1.79 (0.84)	11.22 (1.17)	7.62 (0.60)	4.24 (1.74)	8.21 (3.41)	6.81 (2.05)	5.95 (2.34)	204.140***
Friends in farm business	2.81 (1.18)	1.0 (0.12)	1.02 (0.14)	1.90 (1.23)	1.81 (1.18)	2.02 (0.14)	1.26 (2.14)	56.818***
Seasonal seed sales (tonnes)/Ha	1,029.22 (305.66)	686.22 (305.0)	777.43 (274.41)	650.76 (261.56)	520.44 (218.14)	914.90 (325.41)	397.50 (273.99)	36.590***
Seasonal farm income/ha US$	1,087.33 (360.76)	742.31 (337.49)	709.03 (247.67)	638.81 (393.16)	631.88 (425.35)	989.84 (260.66)	487.33 (360.76)	10.708***

Notes: Mean (standard deviation) values are reported for continuous variables. Ha refers to hectare. One-way ANOVA *F* statistic is reported; significant at the 10% level; **significant at the 5% level; ***significant at the 1% level. Percentage distribution is reported for categorical variables. Chi-square statistic is reported for categorical variables

Source: Authors' own work

(Ammirato *et al.*, 2020; Bignotti and Myres, 2022; Crum *et al.*, 2020; Ljungkvist and Andersén, 2021).

3.2.2.1 Cluster solution assessment and validation. The quality of the clusters was evaluated using the Silhouette measure, reflecting the efficacy of the cluster solution in maximizing between-cluster heterogeneity and within-cluster homogeneity as proposed by Rousseeuw (1987). Silhouette values greater than 0.5 were considered appropriate, whereas values below 0.2 were considered problematic (Tsiptsis and Chorianopoulos, 2010; Cherng and Lo, 2001). In addition, we ensured that the ratio between the largest and smallest clusters did not exceed 3 (Everitt *et al.*, 2011).

To establish the robustness of the cluster solution (Crum *et al.*, 2020), adhering to established conventions (Borch *et al.*, 1999), we used ANOVA to discern significant statistical differences in the input variables, namely, causation, experimentation, affordable loss and flexibility. In addition, ANOVA and Pearson's Chi-squared test of independence were used to probe into the socio-economic attributes of the clusters. Finally, we assessed the differences in farm business performance, quantified by the seasonal volume of sales measured in kilogrammes (kg) per hectare and seasonal farm income measured in United States dollar (US$) per hectare across each cluster, was conducted.

The analysis of the silhouette measure, with a coherence and separation value surpassing 0.5, attests to the high quality and robustness of the identified clusters (Tsiptsis and Chorianopoulos, 2010; Cherng and Lo, 2001) (Appendix 3). Furthermore, the ratio size between the smallest and largest clusters stood at 1.56, confirming the comparability and relevance of the cluster distinctions (Everitt *et al.*, 2011). In accordance with the validated ANOVA, the four clusters displayed statistically significant differences across all entrepreneurial behaviour variables, with remarkably low within-cluster standard deviations from the mean ($\rho < 0.005$, $F = 7.92 \rightarrow 3{,}021.62$). This substantiates the discriminative power and significance of the identified clusters in capturing the varied entrepreneurial behaviours among the commercial smallholder farmers.

4. Results

4.1 Typology of entrepreneurial behaviour among commercial farmers

The results of the TSCA yielded an insightful depiction of the heterogeneity among smallholders in the farm business, identifying four distinctive clusters. This categorization provides a rich understanding of the diverse entrepreneurial behaviours exhibited within the context of smallholder farming. Based on the predominant entrepreneurial behaviours observed within each cluster, the clusters were identified as *non-entrepreneurial farmers*, *means-driven farmers*, *goal-driven farmers* and *ambidextrous farmers*. The details of the identified clusters, along with the respective number of farmers in each cluster, are presented in Table 2.

In our endeavour to understand the differences between the clusters, we examined the average scores of each behavioural variable, namely, causation, affordable loss, flexibility and experimentation, across the four distinct clusters. This analysis identified distinct patterns of entrepreneurial behaviours exhibited by farmers in each cluster. In addition, to provide a comprehensive understanding of the identified clusters, we present detailed summary statistics encompassing the socio-economic characteristics of the on-farm business owners within each cluster. These key insights into the socio-economic characteristics of the cluster members shed light on the diverse backgrounds, resources and spatial contexts that influence their entrepreneurial behaviours.

Non-entrepreneurial farmers ($n = 139$). This cluster encompasses a significant portion of smallholder farmers, distinguished by their relatively lower levels of both causation and

Table 2.
Comparison of cluster characteristics

Variable	Cluster A: goal-driven farmers	Cluster B: non-entrepreneurial farmers	Cluster C: means-driven farmers	Cluster D: ambidextrous farmers	*F*/Chi-statistic
Cluster size ($N = 423$)	104	139	91	89	
Entrepreneurial behaviour					
Causation	34.13 (2.71)^{abc}	13.94 (1.41)^{bad}	14.10 (2.16)^{cad}	37.07 (2.40)^{dbc}	3021.62***
Effectuation	13.88 (1.43)^{acd}	13.87 (1.32)^{bcd}	34.60 (1.96)^{cab}	34.61 (2.17)^{dab}	3021.62***
Affordable loss	3.96 (0.84)^{abcd}	3.71 (0.74)^{bacd}	8.04 (1.06)^{cabd}	9.15 (0.89)^{dabc}	592.16***
Experimentation	5.77 (1.29)^{acd}	5.91 (1.32)^{bcd}	18.85 (2.10)^{cabd}	17.48 (2.83)^{dabc}	1452.42***
Flexibility	4.15 (1.00)^{acd}	4.26 (1.07)^{bcd}	7.71 (1.06)^{cab}	7.98 (0.89)^{dab}	7.98***
Socio-economic characteristics					
Sex of the farmer					
Female	43.19	62.59	57.14	46.07	
Male	54.81	37.41	42.86	53.93	11.352**
Farm location					
Masvingo Ward 23	23.4	14.3	19.5	42.9	
Zaka Ward 2	23.0	41.9	16.2	18.9	
Zaka Ward 1	19.6	17.6	29.4	33.3	
Zaka Ward 15	41.7	30.6	12.5	15.3	
Masvingo Ward 13	28.1	40.6	25.0	6.3	
Bikita Ward 10	19.6	17.6	29.4	33.3	
Gutu Ward 13	15.2	63.6	15.2	6.1	98.724***
Total land size (ha)	2.83 (1.46)^{ad}	2.63 (1.41)^{bd}	2.99 (3.32)^{cb}	3.35 (1.64)^{db}	2.646**
Land under business use (ha)	0.86 (0.48)	0.72 (0.41)^{bd}	0.76 (0.43)	0.88 (0.49)^{db}	3.131**
Distance to the market (km)	6.61 (3.51)^{ad}	7.12 (3.38)^{bd}	6.34 (3.27)^{cd}	4.27 (3.70)^{dabc}	64.241**
Friends owning farm business	2.11 (1.70)^{abc}	1.35 (1.48)^{ba}	2.60 (1.22)^{ca}	3.19 (1.47)	5.523***
Age of the farmer	58.06 (10.39)^{abd}	54.54 (10.92)^{bac}	58.81 (11.14)^{cbd}	53.72 (11.53)^{dac}	2.646**
Education level: less than secondary	42.0	64.75	42.64	41.57	
More than secondary	58.0	35.25	57.36	58.43	21.992***

Notes: Values are mean (standard deviation) for continuous variables. Percentage distribution is reported for categorical variables. One-way ANOVA *F* values reported for continuous variable. ^{abcd}Scheffe post hoc is reported for entrepreneurial behaviours. Chi-square value reported for categorical variables. Within row, values marked with the same superscript letter are statistically different. *, *** denotes statistical significance at 1 and 10% levels, respectively
Source: Authors' own work

effectuation-related behaviours. Within this cluster, farmers exhibit minimal inclination towards experimentation, displaying limited flexibility and placing lesser emphasis on embracing affordable loss as an integral part of their farm commercial process. In addition, these farmers exhibit constrained goal-setting practices, minimal utilization of business plans, limited engagement in profit calculations and restricted implementation of farm risk management strategies. The average age of these farmers stands at 54 years, with a noteworthy majority of 62% being women.

A defining socio-economic characteristic of this cluster is the modest size of their farms, measuring an average of 2.63 hectares, and smaller farm plots under business use, occupying an average of 0.72 hectares. In addition, these farms are situated at relatively longer distances from the market, spanning an average of 7.12 km. An interesting aspect that emerges is that the majority of farmers in this cluster (63%) have not attained a secondary education level, contributing to the diverse educational backgrounds prevalent within the group. Furthermore, the social fabric surrounding these farmers reflects a comparatively smaller network of friends who own a farm business, distinguishing them from the farmers in other clusters. In aggregate, this cluster exhibits relatively lower levels of entrepreneurial behaviours, emphasizing a more passive approach in their farm commercial endeavours. An intriguing geographical pattern surfaces within this cluster, with a significant number of farmers hailing from the districts wards of Masvingo Ward 13, Zaka Ward 2 and Gutu Ward 13.

Goal-driven farmers (n = 104). This cluster stands as the second largest in size, comprising farmers who predominantly exhibit causal behaviours within their farm commercial process. Within this cluster, we observe comparatively lower levels of experimentation and flexibility behaviours, along with a less pronounced emphasis on embracing affordable loss. However, what distinctly sets them apart is their remarkable demonstration of the highest levels of causation behaviours, highlighting their goal-driven approach to farming endeavours. Intriguingly, the average age of farmers within this cluster stands at 58 years, with approximately 55% of them being male, revealing an imbalanced gender distribution.

Moreover, a noteworthy aspect emerges as more than half of these farmers possess educational attainment beyond the secondary level, indicative of their higher academic qualifications. Significantly, the farmers in this cluster manage larger farms, with an average farm size of approximately 0.86 hectares devoted to farm business use. The strategic positioning of their farms is another distinct characteristic, as they are located closer to the market compared to the non-entrepreneurial farmers. This advantageous proximity likely contributes to their ability to learn and respond more swiftly to market demands. What sets these goal-driven farmers apart from even further from non-entrepreneurial farmers is their extensive social networks, as they have by far the largest number of friends who also own farm businesses. This interconnectedness likely fosters knowledge sharing, resource pooling, and collaborative efforts, underpinning their entrepreneurial behaviours. An interesting geographic pattern comes to light, with a substantial proportion of farmers in Zaka Ward 15 belonging to this commercial cluster. This observation adds an important dimension to the spatial distribution of entrepreneurial behaviours among smallholder farmers, offering valuable insights into the diverse contexts and dynamics shaping their pursuit of farm business goals.

Means-driven farmers (n = 91). This cluster emerges as distinctive due to its notable manifestation of high effectuation behaviours. In comparison to the non-entrepreneurial and causal-oriented farmers, this cluster showcases significantly higher levels of experimentation, affordable loss and flexibility behaviours. Interestingly, although

the effectual entrepreneurs display relatively lower levels of causation, their emphasis on leveraging available means to create value, seize opportunities and adapt to dynamic conditions stands out as a defining trait. Notably, this cluster is predominantly composed of female farmers, adding an intriguing gender dimension to the entrepreneurial landscape. Moreover, it comprises older farmers, with the majority lacking attainment beyond secondary education. Despite this educational disparity, their resourcefulness and adaptability, as evidenced by the higher effectuation behaviours, underscore the significance of non-formal knowledge and experiential learning in shaping entrepreneurial practices.

Social networks play a pivotal role in the success of these effectual entrepreneurs. They are remarkably well-connected, with a higher number of friends who also own farm businesses compared to the non-entrepreneurial farmers. Such wide social ties likely facilitate information sharing, access to resources and collaborative opportunities, contributing to their adaptive decision-making and innovative approaches. Farm size is another distinguishing feature, as the effectual entrepreneurs manage larger farms, spanning approximately 3 hectares. However, only around 0.76 hectares of their farms are allocated to farm business activities, indicative of their strategic use of resources. Notably, their farms are situated relatively closer to the market compared to the non-entrepreneurial farmers. The geographic distribution of this commercial cluster reveals a concentration of effectual entrepreneurs among farmers in the Bikita Ward 10 and Zaka Ward 1.

Ambidextrous farmers ($n = 89$). This cluster stands out as the smallest among the four identified groups, yet it boasts a unique combination of high causation and effectuation behaviours ($p < 0.05$). These farmers demonstrate a remarkable ability to balance predictive goal-oriented actions with non-predictive value creation led by means available in the moment, showcasing their ambidexterity in entrepreneurial practices. Notably, this cluster is predominantly composed of male farmers and a significant proportion of them have attained more than secondary education. The higher educational background of ambidextrous farmers may contribute to their enhanced cognitive abilities, adaptive decision-making and capacity to enact both causation and effectuation behaviours effectively.

There are several striking characteristics of this cluster. Firstly, the relatively young age of its farmers in comparison to the causal and effectual-oriented farmers ($p < 0.05$). This age difference suggests that the ambidextrous farmers represent a cohort of emerging entrepreneurs who are keen on adopting versatile approaches to enhance their farm businesses' performance. Secondly, their social networks play a pivotal role, as ambidextrous farmers have on average, two friends who also own farm businesses. This aspect reflects the importance of supportive relationships and peer learning in fostering a combination of effectual and causal behaviours in agricultural entrepreneurship. Thirdly, farm size is another salient feature, with the ambidextrous farmers boasting the largest farm sizes, averaging about 3.35 hectares. In addition, they allocate a significant portion of their land (approximately 0.88 hectares) for farm business activities, demonstrating their commitment to entrepreneurial pursuits. Geographically, the ambidextrous farmers predominantly hail from the Bikita Ward 10 and Masvingo Ward 23. The concentration of ambidextrous entrepreneurs in these areas may suggest the existence of localized factors or regional dynamics that foster the development of both causation and effectuation behaviours among farmers in these regions.

Cluster validation. As an important step of CA, we validated the clusters by relating the cluster structures to seasonal farm performance. Because farm performance may be multi-dimensional and complex to assess, we resorted to three-year average seasonal farm

income (US$) per hectare and seasonal average sales of sales (kg) per hectare. The ANOVA test of the validating variables is summarized in Table 3. Of particular interest, non-entrepreneurial farmers displayed substantially lower seasonal farm income and volume of sales per hectare in comparison to farmers belonging to the other clusters, implying the adverse consequences of limited entrepreneurial behaviours within the farming community. Conversely, ambidextrous farmers exhibited significantly higher seasonal farm income and sales per hectare compared to all other counterparts ($\rho < 0.05$). This intriguing discovery underscores the significance of cultivating both causation and effectuation behaviours in tandem, as it appears to be crucial for achieving enhanced farm performance.

Notably, farmers who predominantly exhibited either effectual or causal behaviours demonstrated statistically lower seasonal farm income and sales per hectare compared to their ambidextrous counterparts. This finding illuminates the importance of combining both predictive goal-oriented actions and non-predictive value creation practices for attaining better levels of farm performance. Such insights underscore the relevance of cultivating ambidexterity in entrepreneurial practices to optimize farm business performance.

5. Discussion

Overall, our empirical findings identified four distinctive clusters of smallholder farmers: non-entrepreneurial, goal-driven, means-driven and ambidextrous, based on their reported levels of causation and effectuation-related behaviours, including experimentation, flexibility and affordable loss. These clusters displayed significant differences in their socio-economic characteristics. Furthermore, in line with existing scholarship (D'Andria *et al.*, 2018; Smolka *et al.*, 2018; Yu *et al.*, 2018; Shirokova *et al.*, 2020), farmers displaying elevated levels of both causation and effectuation demonstrated superior seasonal farm performance when compared to their counterparts.

Firstly, our study builds upon existing entrepreneurship theories and expands our understanding of entrepreneurship in agricultural sector of developing countries (Fitz-Koch *et al.*, 2018; Lans *et al.*, 2013; Fitz-Koch *et al.*, 2018; Yousafzai *et al.*, 2019). Significantly, as the entrepreneurial behaviour in the agricultural sector of developing countries remains inadequately explored (Dias *et al.*, 2019), the diverse entrepreneurial behaviour profiles unveiled in this study pave the way for future research endeavours aimed at unravelling the complexities of farmer entrepreneurship in resource-constrained environments. By exploring effectual and causation among commercial smallholder farmers in rural Zimbabwe, our study took a novel step to adapt and apply Chandler *et al.* (2011)'s instrument to the farm context of a developing country underscoring the applicability of effectuation and causation to the agriculture sector.

	Farm income per season (US$)/hectare	Sales per season (kg)/hectare
Causal-oriented farmers[a]	807.98 (182.16)[abcd]	783.30 (113.97)[abd]
Non-entrepreneurial farmers[b]	463.64 (424.17)[bacd]	312.60 (108.43)[bacd]
Effectual- oriented farmers[c]	727.04 (251.19)[cabd]	794.58 (81.23)[cbd]
Ambidextrous farmers[d]	1201.15 (231.60)[dabc]	1223.17 (155.18)[abcd]
F-value	64.137***	1145.31***

Notes: Values are mean (standard deviation). One-way ANOVA F values reported. [abcd]Scheffe post hoc is reported for entrepreneurial behaviours. Within row, values marked with the same superscript letter are statistically different. *, *** denotes statistical significance at 1 and 10% levels, respectively
Source: Authors' own work

Table 3.
Validating variables

Secondly, by exploring effectuation and causation among farmers, our study provides empirical evidence that establishes a meaningful connection between entrepreneurial behaviours and various socio-economic characteristics among commercial farmers, including sex, farm size, social network, education level and location. Although these attributes have been extensively studied in entrepreneurship literature (Lu *et al.*, 2008; Solomon *et al.*, 2008; Ettl and Welter, 2010; Grande *et al.*, 2011; Jiménez *et al.*, 2015; Bezerra de Melo *et al.*, 2019), their association with farmer entrepreneurial behaviour, particularly in resource-constrained contexts, has remained relatively unexplored. The findings of this study reveal intriguing patterns, indicating that a combination of effectual and causal (ambidextrous) entrepreneurial behaviours is more prevalent among male farmers located closer to the market, possessing higher education levels, owning larger farm sizes and having a more extensive social network. These results align with existing research examining the socioeconomic aspects of entrepreneurship. For instance, the study highlights that a majority of farmers displaying non-entrepreneurial behaviours are women with lower education levels compared to their entrepreneurial counterparts. This resonates with previous studies that have documented the challenges women face in their business ventures compared to men (Welter *et al.*, 2018). Moreover, the study highlights the link between higher education levels and activities involving multiple domains and market participation (Mojo *et al.*, 2017), further underscoring the importance of education in shaping entrepreneurial behaviours. The CA conducted in this study indicates that education levels vary across different entrepreneurial behaviour profiles, yet without testing causality.

By advancing our understanding of the intricate interplay between socio-economic characteristics and entrepreneurial behaviours, our study sheds light on the role of farm size and proximity to the market in influencing farmer entrepreneurship and its outcomes (Grande *et al.*, 2011). We found that farmers exhibiting a combination of effectual and causal entrepreneurial behaviours tend to possess larger farm plots under business use. This observation aligns with the notion that larger farm sizes play a crucial role in facilitating pluri-activity, experimentation and long-term investment planning (Carter and Rosa, 1998; Barbieri, 2013). Previous research by Grande *et al.* (2011) has indicated a positive association between farm size and farm performance. However, their work did not explore the relationship between farm size and entrepreneurial behaviour. Our CA suggests that individuals with larger farm sizes may engage in different entrepreneurial behaviours compared to their counterparts with smaller farms. In addition to farm size, distance to the market emerges as another influential factor. Prior research highlights that market proximity affects market participation and impacts information and search costs (Lu *et al.*, 2008; Grande *et al.*, 2011; Bortamuly *et al.*, 2014). Considering our CA findings and drawing upon diverse streams of entrepreneurship literature (Bortamuly *et al.*, 2014), we contend that farmers located far from the market face greater entrepreneurial disadvantages compared to those situated closer, which in turn constrains their entrepreneurial behaviour.

Thirdly, more fundamentally, our study delves into the implications of entrepreneurial behaviour profiles on farm performance. Although prior studies have explored the performance implications of effectual and causal entrepreneurial behaviours in volatile contexts (Eijdenberg *et al.*, 2017; Eyana *et al.*, 2017; Shirokova *et al.*, 2020; Smolka *et al.*, 2018; Yu *et al.*, 2018), they have not specifically investigated the agricultural context. The results reveal significant variations in seasonal sales and farm income per hectare across the four clusters. In line with Smolka *et al.* (2018), Yu *et al.* (2018) and Shirokova *et al.* (2020), our CA shows performance advantages for individuals displaying a combination of effectual and causal behaviours. Although this finding does not establish a verified causality, it suggests

that enacting a combination effectual and causal behaviours may improve farmers' economic performance.

6. Policy implications

Capacity building among commercial smallholder farmers is necessary for the transformation of the agricultural sector. Based on the findings of this study, two significant implications emerge for Zimbabwean Government policymakers, capacity-building institutions and their partners. The first implication underscores the need for tailored policy focus in areas of capacity development, adult literacy, access to resources, market access and infrastructure development to support farmer entrepreneurship. The second implication pertains to the need to design farmer entrepreneurship development programmes towards cultivating entrepreneurial behaviours. For example, in Zimbabwe, these implications are important for the Comprehensive Agriculture Policy Framework 2012–2032 (Government of Zimbabwe, 2012) and the government of Zimbabwe's Vision 2030 (Government of Zimbabwe, 2018), acknowledging the heightened need for tailored investments in the transformation of the smallholder agriculture.

Our findings show that commercial smallholder farmers differ in their socio-economic characteristics, namely, resources endowment, geographical location, gender, age, education level, among others. In line with policy needs, findings of this study imply that smallholder farmer support programmes should be tailored to their entrepreneurial behaviours and socio-economic heterogeneity. Generally, for areas with non-entrepreneurial farmers, this can be done through improving roads and communication networks and revitalizing or establishing local markets to reduce distance to the market. These farmers could also be supported through programmes strengthening social networks such as supporting farmer field days and membership to cooperatives. In addition, policymakers and practitioners, including international and local non-governmental organizations (NGOs), need to careful design agricultural education and training programmes to support and encourage farmers to develop their capacities on the basis of their existing behaviours. This should be coupled with gender inclusive policies that support adult literacy programmes, business schools, farmer field schools and entrepreneurship education programmes. Success from other developing and emerging economies in Asia (Pratiwi and Suzuki, 2017) and Africa (Davis *et al.*, 2008; Lourenço *et al.*, 2014; Opolot *et al.*, 2018; Adeyanju *et al.*, 2023) show that building the skills for farmers through entrepreneurship training programmes has multiple benefits in tackling urgent socio-ecological challenges from the community grassroots.

Beyond this broad policy focus, entrepreneurship development programmes by the government, NGOs, agriculture extension providers and universities in Zimbabwe need to prioritize the cultivation of both effectual and causal behaviours in the core of capacity-building practices and incentives for fostering farmer entrepreneurship. To achieve this, these capacity-building institutions should implement targeted entrepreneurship training programmes, workshops, business clinics and farmer field schools aimed at enhancing both effectual and causal behaviours among smallholder farmers. However, these entrepreneurship programmes should be tailored to the entrepreneurship capacity needs and socio-economic characteristics of commercial smallholder farmers. In doing so, they have the potential to support processes of socio-economic inclusion and reduce rural inequalities depending on how they tailor programmes and policies to the distinct farmers' behaviours and socio-economic characteristics (Barzola Iza and Dentoni, 2020).

For farmers facing challenges in managing limited resources, setting and pursuing goals and improving farming success, capacity-building programmes should be tailored to focus on key farm management activities, including planning, budgeting, profit calculations and

risk analysis. Contributing to the achievement of existing policy objectives, these programmes could be complemented by efforts to enhance access to financial resources through facilitating partnerships with financial institutions or government initiatives that offer affordable loans, small grants or subsidies (Mariyono, 2019). In addition, the government and NGOs can play a role in fostering market linkages, connecting smallholder farmers with buyers, wholesalers and value-added processing industries to ensure a consistent market for their produce (Manyise and Dentoni, 2021). Reliable and up-to-date information on market trends, input prices, weather patterns and emerging technologies can be provided through agricultural extension services, online platforms or mobile applications. This information will reduce the amount of uncertainty and reinforces a causal orientation among farmers (Yu *et al.*, 2018).

Conversely, for farmers struggling to navigate and adapt to socio-ecological shocks, support programs should prioritize fostering trust relationships among farmers, as well as between farmers and their buyers and suppliers (Krishnan *et al.*, 2006; Lu *et al.*, 2008; Xhoxhi *et al.*, 2021). These efforts can be supported by delivering effectuation-specific extension advisory services through providing reading manuals or expert assistance. Extension and training initiatives should focus on promoting adaptive management strategies to help farmers adjust their practices in response to changing conditions (Cho and Lee, 2018). Interventions such as establishing demonstration farms, peer learning groups and input subsidies could encourage farmers to experiment with new techniques or crop varieties better suited to evolving environmental and market conditions. Furthermore, fostering collaboration and collective experimentation, for example, by encouraging membership in farmer cooperatives or associations, can facilitate experiential learning processes (Ochago *et al.*, 2023). Farmers can learn from one another's successes and failures, leading to adaptive adjustments in their approaches (Xhoxhi *et al.*, 2021). Regular training of extension agents plays a crucial role improving knowledge dissemination, facilitating learning networks and providing ongoing support to farmers in this regards.

7. Conclusions

The study set out to understand which farmers' behaviours are entrepreneurial, and how, by empirically developing typologies of commercial smallholder farmers in Zimbabwe based on the notions of effectuation and causation. The implications of the study are twofold. Firstly, it provides typologies that support the effectiveness of policies, interventions and strategies supporting farmer entrepreneurship. Secondly, it highlights the importance of directing capacity development programmes towards cultivating a more grounded understanding of farmers' entrepreneurial behaviours. The study illustrated how effectuation and causation, often used in non-agricultural contexts, can be adapted and applied to enhance research and orient policies in the domain of farmer entrepreneurship. In doing so, this research sets itself apart from the majority of studies that construct farmer typologies based on entrepreneurial traits, attitudes, skills, goals and identities. The introduction of effectual and causal behaviours made it possible to capture the salient entrepreneurial features among commercial farmers, otherwise missed by the generic farmer entrepreneurship typology literature. The resulting four-cluster solution revealed heterogeneity among farmers in terms of their causal and effectual entrepreneurial behaviours, with farmers exhibiting a combination of these behaviours showcasing a higher performance, underscoring the significance and importance of considering these behaviours in farmer entrepreneurship research. Leveraging insights from this study, the measures of causation and effectuation can be adapted to suit any empirical context in farmer entrepreneurship; however, effort must be made to test the reliability of the variables as measures of the same construct.

Findings suggested that, although broad policies can tackle shared challenges among rural Zimbabwe's smallholder farmers entering commercial ventures, tailored typology-specific programmes for enhancing entrepreneurial capacities are necessary. The findings underscore the significance of ensuring access to extension services tailored to the unique needs of farmers, securing access to land, facilitating access to finances and facilitating market entry as pivotal for fostering early-stage farmer entrepreneurship. Subsequent research could delve into the temporal dimensions of these entrepreneurial behaviours, exploring their emergence and evolution under varying support conditions over time.

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Appendix 1

Table A1. Behavioural comparison of effectuation and causation in farm business

Dimension	Effectual behavioural characteristics	Causal behavioural characteristics
a. Means vs goals	The farm business is driven by available means and resources	The farm business is driven by strict targets (e.g. volume of sales, output and capacity utilization)
b. Affordable loss vs maximizing returns	The farm business is guided by advanced commitments to what one is prepared to lose	The farm business approach is oriented towards maximization of returns
c. Alliances vs competitive market analysis	Uncertainty is reduced by building partnership and pre-commitments of self-selected stakeholders	Uncertainty is identified and avoided through market and competition analysis and other means, e.g. higher inventories
d. Leverage on contingencies vs avoid the unexpected	Contingencies/surprises are seen as a source of opportunities	Contingences/surprises are avoided or quickly overcome to reach given farm targets

Source: Adapted from Chandler *et al.* (2011)

Table A2. Dimension reduction of input variables used in cluster analysis

Factor	Items (from 1 to 5)	Factor loadings	Statistics and tests	Previous studies
Causation	Avoiding surprises	0.946	Mean (s.dev) = 24.9 (10.10)	Chandler *et al.*, 2011
	Use of formalized strategies	0.936	Cronbach alpha = 0.974	
	Activities to reach farm targets	0.934	Factor = 1	
	Focus on farm enterprise potential returns	0.920	Explained variance = 82.78%	
	Profit calculations of farm enterprise	0.913	KMO = 0.953	
	Identifying farm risks	0.911	Batlet test = 4,652.02***	
	Farm business planning	0.904		
	Laying of farm business goals	0.807		
Experimentation	Trying a number of inputs	0.928	Mean (s.dev) = 11.78(5.12	Chandler *et al.*, 2011
	Allowing production methods to evolve	0.925	Cronbach alpha = 0.941	
	Experiment with different methods	0.915	Factor = 1	
	Trying with available resources	0.838	Explained variance = 81.38%	
			KMO = 0.853	
			Bartlet test = 1,659.79***	
Flexibility	Adapting farm activities	0.955	Mean (s.dev) = 8.86 (4.06)	Chandler *et al.*, 2011
	Avoiding activities that limit flexibility	0.947	Cronbach = 0.938	
	Taking advantage of new opportunities	0.845	Factor = 1	
			Explained variance = 84.18	
			KMO = 0.746	
			Bartlett's test = 1,199.99***	
Affordable loss	Focus on what the farmer is willing to lose	0.822	Mean (s.dev) = 5.74 (2.77)	Chandler *et al.*, 2011
	Focus on minimum potential risk	0.669	Cronbach's alpha = 0.952	
			Factor = 1	
			Explained variance = 84.18%	
			KMO = 0.599	
			Bartlet test = 256.256***	

Source: Authors' own work

Appendix 3

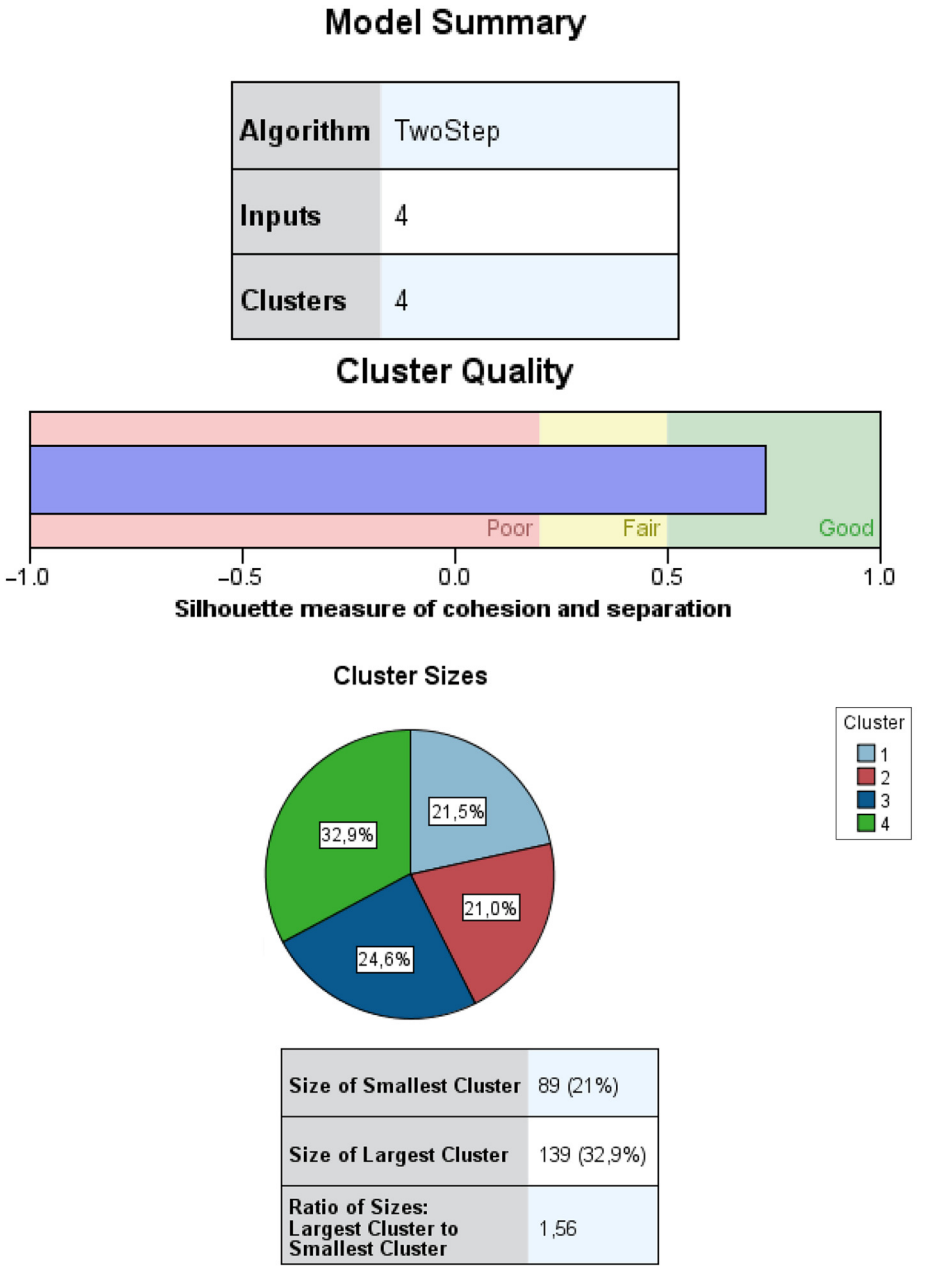

Figure A1.
Cluster analysis

Source: Authors' own work